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PRACTICAL WINERY & VINEYARD (ISSN 9739-8077) is owned and published by PWV Incorporated. Published bi-monthly at subscription rate of $31/year. Outside the United States, please add $10US, sea mail; $18US, air mail. Postmaster: Please send change of address to 58-D Paul Drive, San Rafael, CA 94903. Back issues: $5 prepaid. News media may use no more than 1/4 page of material per issue provided that PRACTICAL WINERY & VINEYARD is credited.

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Cover photo: Trellised and head-pruned Zinfandel vines at Sobon Estate. Photo by Fred Lyon.

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Leon Sobon uses a grape knife to emphasize the small Zinfandel clusters with small berries produced by trellised vines in Carson Vineyard.

SOBON ESTATE

TRELLISED VINES PRODUCE Reserve Zinfandel

BY Ken Young

Many Zinfandel devotees have long held that the finest Zinfandels come only from old vines. Large producers of Zinfandel tend to buy grapes exclusively from head-trained, spur-pruned vines more than 50 years old.

Leon Sobon, winemaker/owner of Amador County's Sobon Estate (Plymouth, CA) challenges that practice: "You don't need old vines to make great Zinfandels." Sobon backs his contention with an impressive collection of wine competition medals awarded over the past three years to his Sobon Estate Reserve Zinfandel, made from his Carson Vineyard vines planted in January, 1993.

Sobon maintains that super Zinfandel can be a product of innovative grape growing and diligent viticultural practices. In 1977, he left the Lockheed Research Labs and moved to a house on a hill overlooking the northern part of the Shenandoah Valley, where he established Shenandoah Vineyards.

With experience making Zinfandel from purchased grapes in his Los Altos backyard cellar, Sobon was no stranger to winemaking. He crushed 26 tons of grapes in his first commercial harvest. While much of that 1977 harvest went into White Zinfandel (for cash flow reasons), Shenandoah's reputation for rich, hearty, full-bodied red Zinfandels began with a 1977 red Zinfandel.

Out with old vines

When the historic D'Agostini Winery and its 113 acres became available in 1989, Leon and Shirley Sobon recognized an opportunity to produce estate Zinfandel from some of Amador County's oldest vineyards. Along with their sons Robert and Paul, they renamed it Sobon Estate, the property facilitated the emergence of Sobon's single vineyard Zinfandel program.

Sobon's Carson Vineyard originally was a 5.5-acre block of D'Agostini's Zinfandel vines planted around 1856. When Sobon took over the vineyard, it was apparent that these ancient vines were failing, and after the 1991 harvest, they were removed.

As a former ceramic research engineer whose specialty was growing sapphire and other crystals for use in industrial lasers and luminescent products, Sobon has always thrived on innovation and experimentation. "While some people read novels, I prefer reading technical journals and research materials," he muses. Removal of the old, unproductive Zinfandel vines gave Sobon the perfect opportunity to implement some innovative viticultural concepts.

After removing the old vines and allowing the ground to lie fallow with a cover crop for one year, the Carson Vineyard was replanted in 1993 with 110R rootstock (which had not been done in Shenandoah Valley before).

"There was a UC Davis rootstock trial in the valley," recalls Sobon. "But all the old-timers had been planting and replanting with St. George rootstock. I wanted to try something different."

He knew from the trials that 110R was a more vigorous rootstock that threw fewer lateral shoots than St. George. He felt 110R was capable of producing a good yield that could be controlled with a cover crop and prudent thinning.

He also knew from experience that small crops produce better wines, and that head-trained Zinfandel on St. George tends to produce small yields. The challenge then was to devise a method for producing a small, quality crop from a very vigorous rootstock. Sobon's solution was to trellis the new Zinfandel vines.

What Sobon discovered beginning with the first vintage from Carson Vineyard (vinified separately in 1999) was that the combination of 110R rootstock, trellised vines, and careful vineyard practices resulted in "absolutely fabulous grapes." The Carson Vineyard is now Sobon Estate's premier vineyard, producing fruit exclusively for Sobon's flagship Reserve Zinfandel.

Sobon then set out to compare the development of the vines, fruit, and resulting wines from the young Carson Vineyard with those of the adjacent old vine Cougar Hill Vineyard. Both vineyards are on Shenandoah sandy loam soils, and neither is irrigated.

The primary differences between the two vineyards are that vines in Carson are spaced 8 x 10 feet, and trellised. Budwood is from the 90-year-old Lubenko Vineyard (available from nurseries as the Shenandoah clone). Sobon maintains that the trellis provides the opportunity to get light into the fruit zone. The older Cougar Hill is a head-trained vineyard spaced 8 x 8. Cougar Hill vines are an unknown scion on St. George.

Magic of light in fruit zone

"I read all the material published by Richard Smart, Mark Kliewer, and

other vineyard experts about light exposure," Sobon relates. "It has been pretty much proven around the world now that really top quality grapes can be grown if you give the grape clusters and leaves good light exposure."

According to Sobon, the scientific work on the importance of sunlight on the vines has been done at UC Davis and Fresno State in California, in Oregon, Australia, New Zealand, France, and Germany. Sobon took his direction from this work and his own experience with his Sauvignon Blanc vineyard.

Shade in Sauvignon Blanc vines

"Originally, our Sauvignon Blanc was planted in 1978 with a "T" trellis, and the first wines were very green and vegetative," he recalls. "Our first full year in production, we had a yield of seven tons per acre. The next year yield dropped to between five and six tons, then down to three tons."

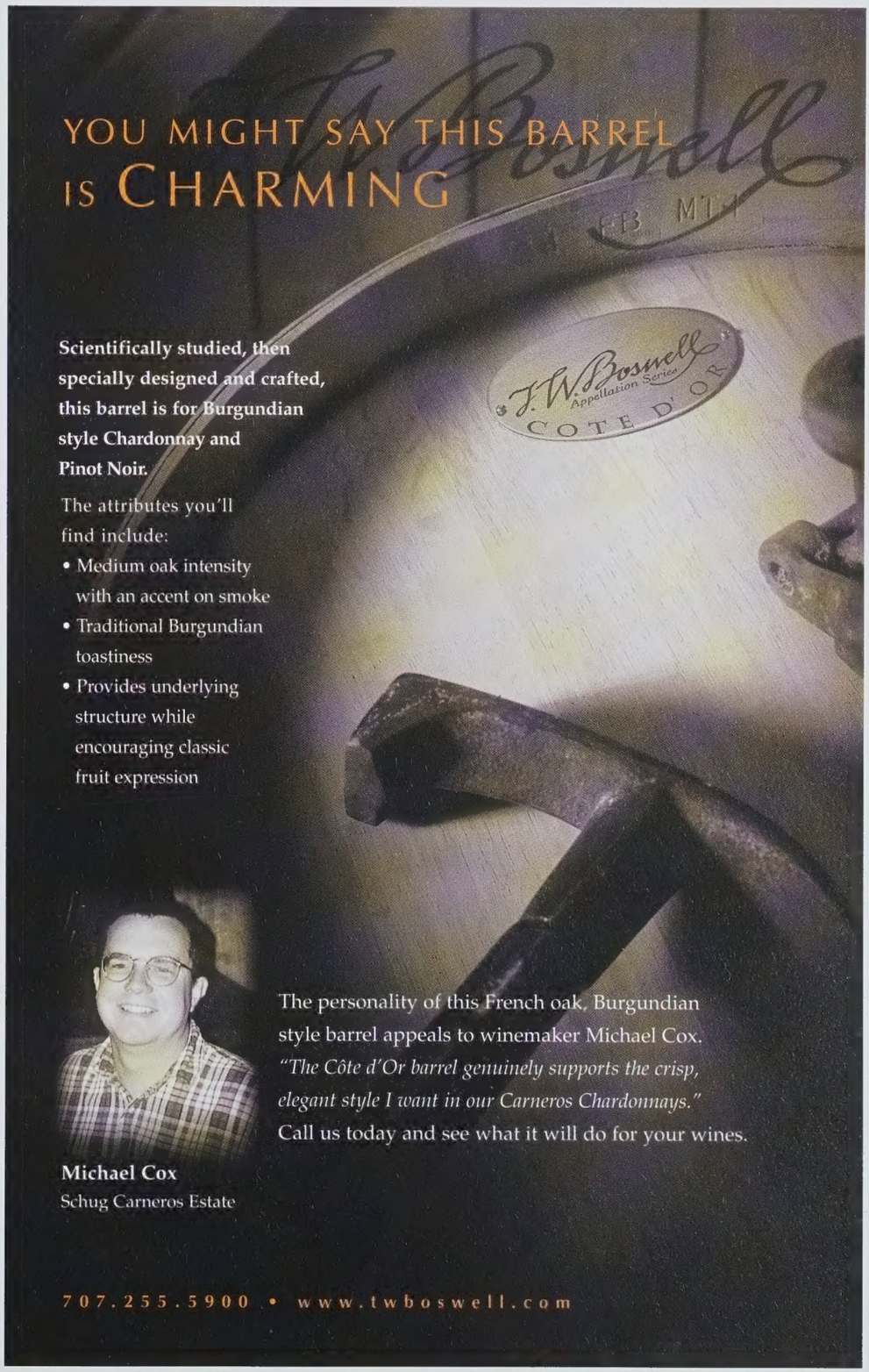
Sobon discovered that the buds for the succeeding year were being severely shaded by the thick canopy. University studies have determined that canes grown in the shade will produce substantially less fruitful buds. Therefore, the shaded buds would produce a small crop.

A small crop results in more canopy vegetation because the vine will produce a fairly consistent total weight of fruit and leaves. The less fruit, the more leaves. The more leaves, the more shading — and the less fruit, the following year.

"After reading Professor Alain Carbonneau's work on the effect of sunlight on fruit development, we planted a vineyard to his Lyre system, and began converting our Sauvignon Blanc vineyard to quadrilateral cordon," Sobon relates. "I experimented the first year with two rows by putting four new canes on the top trellis wire and cutting off the old bilateral cordons.

"In essence, I turned the whole vine upside-down, so instead of fruit hanging down under the leaves, I had fruit on the top wire and the canes hanging down. This is essentially the Geneva Double Curtain trellis used in New York state."

Sobon immediately realized an "unbelievable" improvement in fruit quality. The grapes had better acid, better pH, and significantly better flavors with minimal vegetative character. Yields returned to the five to six tons per acre range with noticeably smaller clusters. "The resulting wines proved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to me that grapes need light to improve their flavor and chemical balance," Sobon observes.

Trellising Zinfandel

The principle of trellising vines to minimize shading of fruiting buds was applied to the new Sobon Estate Carson Vineyard.

"Zinfandel is not as vigorous as Sauvignon Blanc, so we didn't have to turn the whole vine upside down," Sobon explains. "We get plenty of light because there isn't an excess of canes and leaves to do the shading when you spread the Zinfandel cordons out on the wires."

Sobon notes that, with young head-trained Zinfandel vines, all the leaves and canes are concentrated near the head of the vine, so most of the clusters are naturally shaded.

In his opinion, one beauty of growing vines on a trellis is that you can see every cluster and how much light exposure it is getting throughout the growing season. He contends that head-trained vines are "big, thick bushes," and he can see only about one-third to one-half of the clusters on head-trained vines because the rest are hidden by foliage inside the vine. Even though growers do crown-suckering and other vineyard management practices, there is substantial shading of buds and fruit down inside the vine.

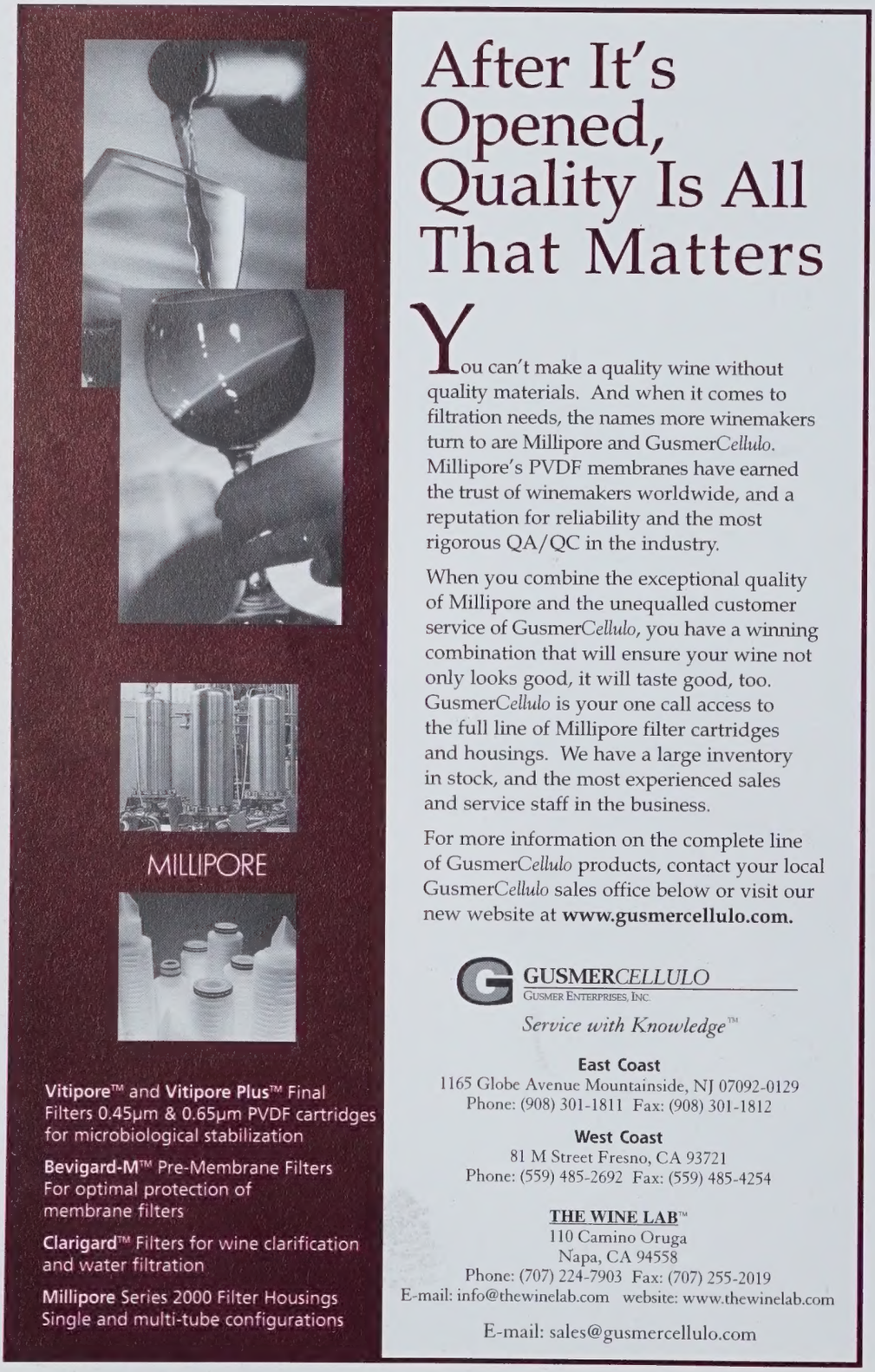
"We found a tremendous increase in color with trellised vines," Sobon says. The "Carson Vineyard Zinfandel makes dark, black, inky wine. We get good color extraction from trellised vineyards without doing any blending to enhance color."

Viticultural practices

Sobon employs what he believes to be the most effective viticultural practices available in both vineyards. In the spring, when the shoots are about 12 inches long, the first suckering is done in both vineyards. In the old, head-trained Cougar Hill Vineyard, the bottom and trunk of the vines are suckered and the centers are cleaned out, leaving only two shoots on each of seven spurs.

In the bilateral trellised Carson Vineyard, four spurs per cordon are retained because of the wider spacing. "We do pretty much the same pruning and thinning on both the head-trained and trellised vineyards, but we only do it once each season for the head-trained vines," Sobon explains.

Typically, old-time Zinfandel growers would thin by removing only the bottom suckers because Zinfandel vines don't produce many small shoots. As growers improved the quality of their fruit and correspondingly made finer wines, they began moving up the vine to crown-sucker and remove all the extraneous shoots in the middle of the crown. In fact, many Amador growers with winery contracts outside the county are required to do this intensive suckering.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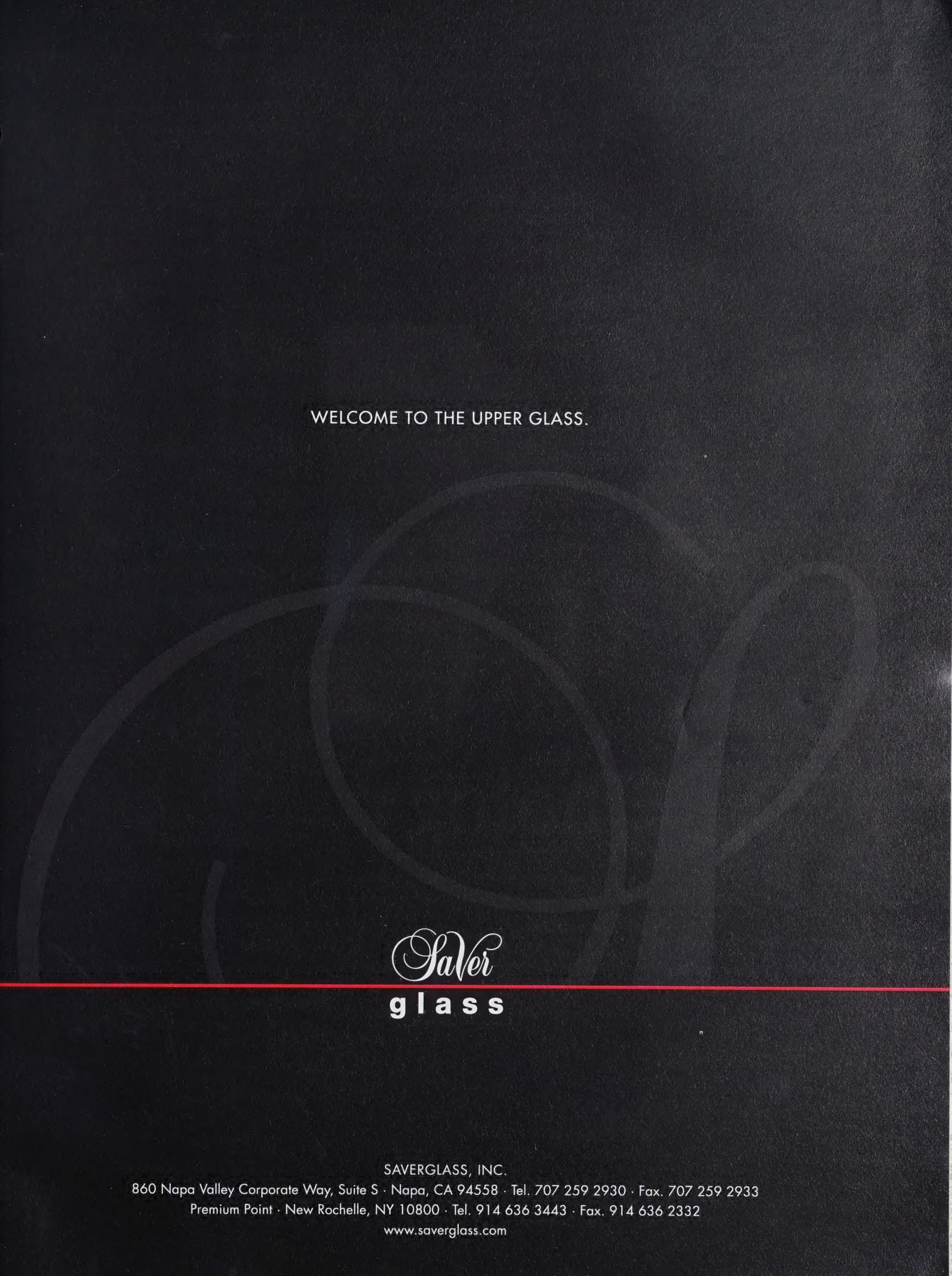

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Sobon states that intensive suckering is what he has been doing all along to enhance his own grapes. "We have gone down to just two shoots per spur, which limits the crop and opens the vine to more light. We don't have any mold problems, and we attribute that to our intense suckering."

If head-trained Zinfandel is too heavily suckered and/or the site is vigorous or irrigated, the berries will be very large, and a second crop is produced. Each shoot that remains after suckering will keep growing and send out small lateral shoots, which produce small clusters. These clusters can ripen as much as a month after the primary crop. To produce the finest Zinfandels, these extra laterals and the second crop are usually removed.

Young vines tend to be more vigorous and shoot more laterals. Sobon claims this situation can be dealt with immediately in a trellised vineyard. Also, if some of the new shoots that come off the spurs are not developing as fast as others, he contends that there is a weakness in the vine that must be corrected by removing the shorter shoots or removing the crop from that shoot. The vine will then put more energy into the remaining shoot, thus returning the vine to balance.

The Carson Vineyard trellis is a vertical three-wire system with the bottom cordon wire at 40 inches above ground. One catch wire is at 52 inches and the top wire is 64 inches above ground. Pre-veraison, the shoots should be one to two feet long above the top wire. About half-way into the growing season, Sobon's crews remove the shoots or crop from shoots that don't reach the top wire.

"We walk the Carson Vineyard, suckering and thinning for vine balance three times during the growing season, with the last time at about 75% veraison," Sobon notes. "At that time — at about 17° to 18° Brix — we remove clusters that have little or no color for our White Zinfandel production which balances the remaining crop on the vines. In the 2001 and 2003 vintages, every shoot was thinned to one cluster. Thinning late has the advantage of the remaining fruit having small clusters and small berries.

Harvested fruit comparison

At harvest, grapes from the Carson Vineyard are almost uniformly well-colored, according to Sobon. However, a cluster of head-trained Zinfandel at harvest will contain raisins, half-raisins, fully red berries, slightly pink berries, and even some green berries, and many clusters will be under-ripe.

Though Carson grapes have no under-ripe clusters, they still have a spectrum of ripeness within the cluster. Sobon believes that's a good thing: "I think this uneven ripening of Zinfandel is notorious and necessary for producing the broad spectrum of interesting flavors and aromas that are characteristic of Zinfandel."

Grapes from Carson Vineyard not only have better color, Sobon continues,

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but they produce better flavors because the anthocyanins and other phenolics that produce color also produce flavor. The acids (0.6 to 0.8 gm/L) and pH (3.3 to 3.5) at 25° Brix are better in Carson grapes, probably due to less shading, though the different rootstock may also have some influence on these factors.

"For years, I have suspected that 110R will produce Zinfandel with better acid/pH, but only base this on empirical results of uncontrolled experiments."

Vine balance is one of Sobon's primary goals. The openness of the trellised vines helps achieve that goal. He defines balance as all the clusters on the vine ripening at the same time and all the canes growing to about four to five feet in length, with little or no senescence of leaves at harvest.

Uneven ripening is far less severe in the trellised vines, and slowly developing clusters can be removed because trellising allows crews to see all the grapes during the growing season. Raisining is also minimized with balanced vines.

Sobon does not set any specific yield goals for his vineyards. Whatever quantity the vineyard produces, given his viticultural philosophy and practices, is OK with him. Because he doesn't sell his grapes, he isn't concerned with bunch counts or berry weights. His concern is quality fruit, and that means about 2.5 to three tons per acre for both the Carson and Cougar Hill vineyards.

The 2003 crop yielded 9.1 lbs/vine at 26.4° Brix, 3.52 pH, and 6.05 gm/L total acidity.

Self-regulating Zinfandel

Sobon contends that winemakers want to buy old vine fruit because old vines tend to limit yield and balance themselves. He believes that Zinfandel vines become self-regulating/self-balancing at about 25 to 30 years, depending on growing conditions. If the site is not very fertile or is low in soil moisture, self-regulation could occur as early as 20 years, while vines in more fertile conditions may not self-balance for 35 to 40 years.

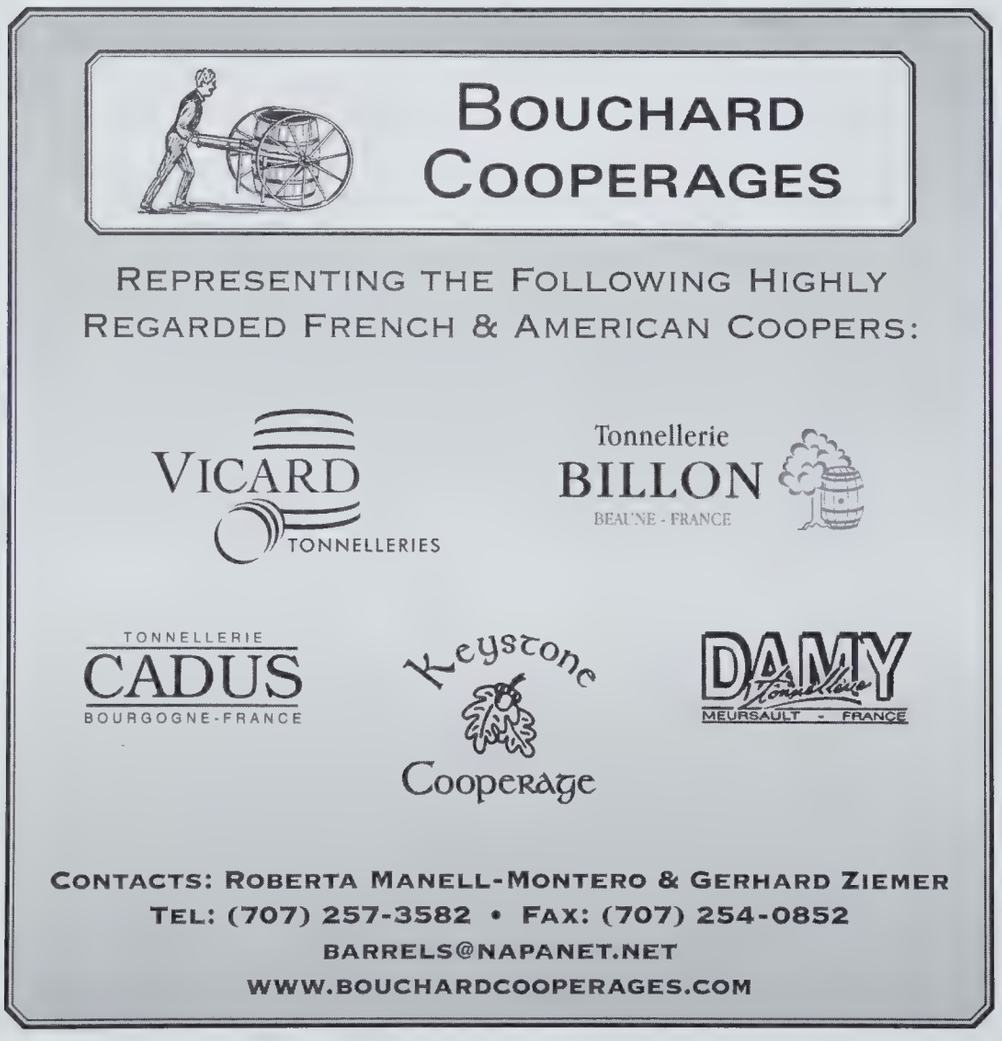
Self-regulated vines "kind of take care of themselves," observes Sobon. "Canes never get too long, and if pruning is balanced, they rarely set a second crop, and that limits the size of the crop."

Self-regulated vines typically will produce only 2.5 to three tons per acre, while young vines will want to produce five to six tons per acre on average. "The result is more intensity of color, flavor, and aroma from old vine fruit," Sobon adds.

Carson Vineyard produced the first Sobon Estate Reserve Zinfandel from six-year-old vines planted in 1993. Since its initial release in 2001, the 1999 vintage has garnered six gold and four silver medals in five wine competitions. Cougar Hill Vineyard Zinfandel received four gold medals and one silver medal for the same vintage.

Vinification

Vinification of wines from both Carson and Cougar Hill is identical. Fermentation occurs in three-quarter-



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This regime of simultaneous yeast and ML fermentations works well for high alcohol wines. The cap is hand-punched five or six times per day. The wines are pressed two days past dryness and put in barrels; 30% are new World Cooperage American oak (air-dried 30 months). All wines are bottled completely dry, unfined, no filtration, and complete MLF.

Paul and Leon Sobon share the winemaking. They aim for a style that is big and rich with ripe fruit predominating; and only enough ripe, soft tannins for balance.

The alcohol content varies with the vintage, but is usually 14.5% to 15.5%, with a bottling TA above 0.6 gm/L and a pH about 3.5 for the Carson Vineyard. Cougar Hill generally has alcohol between 14% and 15%, TA between 0.5 to 0.6 gm/L, and around 3.6 pH.

Summary

Has Sobon proved his contention that young, trellised vines grown with state-of-the-art viticultural practices can produce Zinfandel with color, flavors, aromas, and textures equal to or exceeding those of old vine Zinfandels? He certainly makes a strong case when one compares wines produced from Carson Vineyard with its 60- to 70-year-old head-trained neighbor, Cougar Hill Vineyard. ■

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BOOK REVIEW

TRUE TO OUR ROOTS

FERMENTING revolution at Fetzer

BY Carol Caldwell-Ewart, Senior Editor

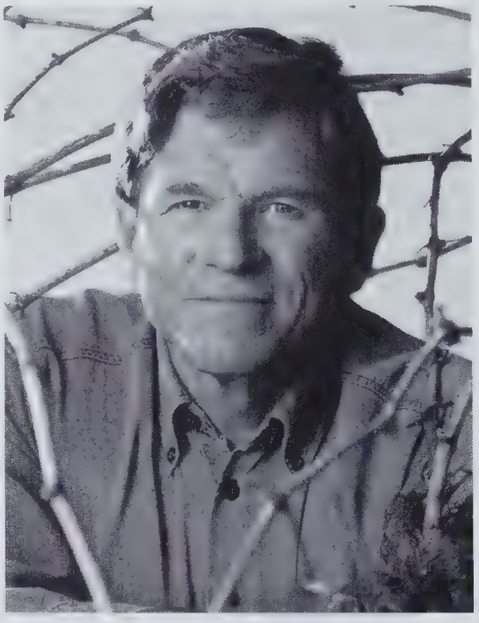
Fetzer Vineyards' Paul Dolan wants to make the world a better place, and he believes the path to that goal is through creating sustainable businesses. His new book, *True to Our Roots: Fermenting a Business Revolution,* written with Thom Elkjer, maps the path for other businesses that would like to travel it, too.

A little bit Norman Vincent Peale, a little bit Mahatma Gandhi, and a lot Paul Hawken, Dolan offers loads of inspiration, vision, and positive thinking. However, he didn't leap into adulthood as a sustainability guru. In the course of the book, Dolan reveals his own struggle to overcome the personal flaws that kept him from admitting mistakes, insisted that he "command and control" every situation, and led him to use others to advance his own ambition.

Dealing with these issues and changing the way he related to his family and colleagues also opened his mind to changing the way he looked at the vineyards. Dolan's conversion began during harvest in 1987 when he sampled organically farmed grapes and found them significantly better than conventionally farmed grapes growing nearby. "I didn't know it then, but my entire way of thinking about grapegrowing was about to change, with huge ramifications for me personally and for Fetzer," he writes.

As he learned more about organic grapegrowing, Dolan began to realize the impact of the chemical pesticides and fertilizers Fetzer had been using. "It was my land, my heritage, the home of my children — and my winery was poisoning it … It was very clear to me that Fetzer Vineyards and … all other wineries were risking not only their own economic futures but the long-term viability of all farming. It was an inherently unsustainable position."

Weighed down with this realization, Dolan was about to leave the wine industry: "I loved making wine, but I didn't see how I would make my mark on society by doing that. It seemed that I had to leave the business world to make a difference, for myself and for others."



President Paul Dolan believes that creating sustainable businesses will make the world a better place.

But before he could make his move, Brown-Forman Corporation bought Fetzer and made Dolan president. Suddenly he had the opportunity to incorporate his emerging ideas at Fetzer. "I moved immediately to steer the company into a new course, one that would be described today as 'sustainable.'"

The six chapters of *True to Our Roots* describe the guideposts at the heart of Dolan's philosophy of business:

- Your Business Is Part of a Much Larger System: "All our businesses share one planet and one future." For better or worse, every action by every business affects that system, Dolan explains.
- Your Company's Culture Is Determined by the Context You Create for It: "With the right culture, sustainability shifted from a concept to a concerted action; it was woven into the fabric of the company, not dictated from above."
- The Soul of a Business Is Found in the Hearts of Its People: "If you see your people as great, they will show up as great, . . . shifting from accountability to responsibility."
- True Power Is Living What You Know: "At Fetzer, living what we knew about the land, our people, and our community generated a wealth of new understanding — a virtuous cycle of knowledge and empowerment."
- You Can't Predict the Future, But You Can Create It: "Sustainability requires that we orient ourselves toward the larger purpose, because this orientation will naturally organize the process for achieving it."
- There Is a Way to Make an Idea's Time Come: "Now that our business has taken a stand for sustainability, everyone in the company is personally engaged, responsible for its realization, and open to whatever path that completion might take. Taking a stand publicly produced immediate results in the wine industry by expanding people's understanding of what's possible for them, their companies, and their world."

From the beginning, Dolan says, Fetzer employees "rallied to this new possibility with inspiring passion and creativity." The process of discovering the principals of sustainable business and putting them to work at Fetzer over

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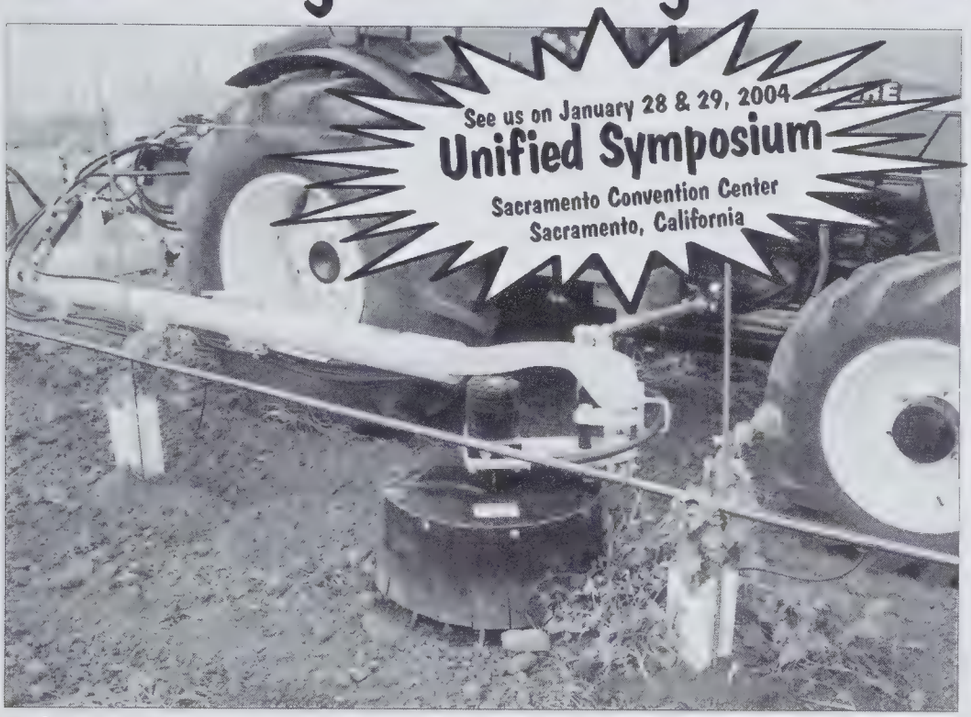

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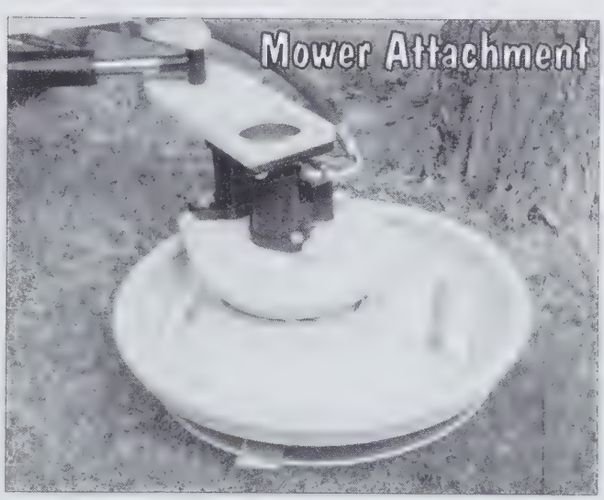

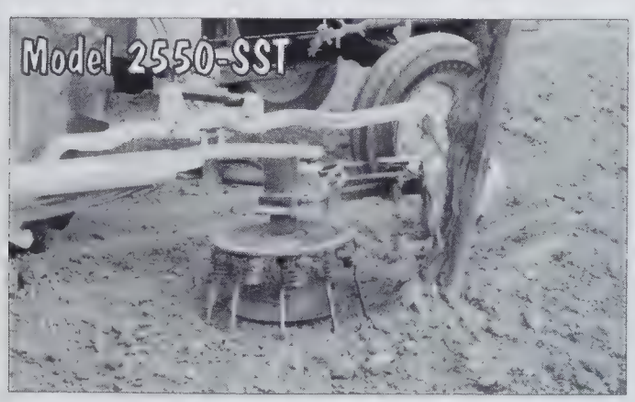

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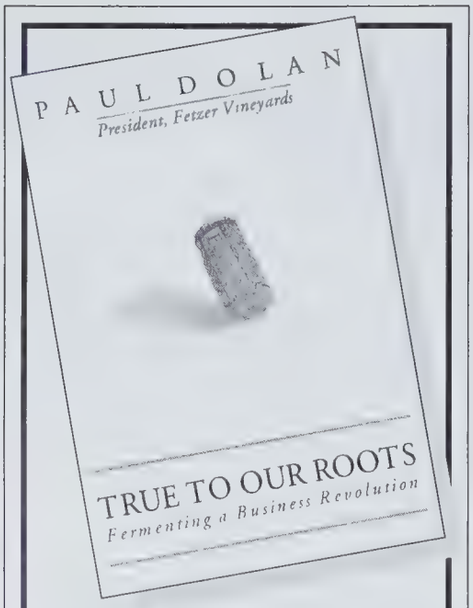
BOOK REVIEW



Learn the six guiding principles Paul Dolan discovered and developed at Fetzer Vineyards, which can help managers everywhere build stronger, more sustainable companies.

Filled with personal anecdotes and practical wisdom, *True to Our Roots* provides both a fascinating glimpse into the California wine industry and heartening proof that business can do well by doing good.

Paul Dolan is a fourth-generation California winemaker, who in 1992, became president of Fetzer Vineyards, one of the largest, best known wineries in the U.S.

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the following decade resulted from their combined efforts. Their financial success in building Fetzer — 15% growth per year to become the largest California brand in the U.S. in the premium $7 to $10 category, producing 4 million cases of wine a year — proves that point in conventional terms.

But it's not enough, Dolan says, for a business to be financially successful in the short term — seemingly the guiding principal for American business for the last 20 years. "The business of business is sustaining its long-term success," he says. Sustainable success requires recognizing these essential truths: "Natural resources are not unlimited, and human beings are not expendable."

Fetzer began using the sustainability advocate's yardstick to measure success — "the triple bottom line." Dolan explains: "A successful sustainable business is one that provides steady shareholder returns while improving the quality of life for its workers, the communities it calls home, and the environment it touches. Its strategic perspective reaches out beyond the next four quarters, beyond the next five years, to consider what's ahead for the next generation."

At Fetzer Vineyards, the corporate culture began expressing these ideas as E^3: "economics, environment, equity (for our employees and our community)." Dolan says he was gratified to see how nearly every employee in every department took ownership of these concepts and began thinking about doing business in these terms.

Because every department examined itself and its actions in light of E^3, changes springing from the grassroots swept the company. A few of the results measured since 1992 illustrate the effect of this perspective: Fetzer has become one of the largest growers of certified organically grown grapes in the world, and vines are irrigated with recycled, treated water.

Bottles are 40% recycled glass; the company's contribution to the waste stream has been reduced by 94%; and the winery is chlorine-free. Fetzer has contributed to sanctuary for herons and birds of prey, has restored and enhanced river tributaries, switched to 100% renewable power, and received innumerable state and national awards for environmental excellence and waste reduction. Perhaps most telling of all, employee turnover has shrunk to 1%.

One might conclude from all this that Fetzer's success to date would have the company resting on its laurels. But being a sustainable business is a never-ending process, and Fetzer Vineyards is on to new challenges.

In 2002, Dolan announced that by 2010, Fetzer will make wine only from organic grapes. Though the company's 2,000 acres of estate grapes are 100% certified organic, that's only 20% of what the winery uses. Contract growers who supply the other 80% of the grapes for Fetzer wines will have to be persuaded to farm organically or — one assumes — be replaced.

Dolan believes that you build a business by envisioning where you want it to be in 10 years and then running the business today in a way that will achieve your vision. The 100% organic goal illustrates how he hopes to spread this sustainability philosophy — taking the message first into the wider community of the wine industry and leading by the example of Fetzer's success. He believes that, given the opportunity, all people want to make the world a better place, and that Fetzer growers will rise to this challenge.

This book is the next step in Dolan's plan to make the world a better place. With it, he takes his sustainable model into the wider world of business. Bloomberg Press, business publisher of a wide variety of practical investment guides and *The Economist* book series, puts Dolan in credible company.

Missing from *True to Our Roots* is the story of the role Brown-Forman played in the business revolution at Fetzer. That's too bad, particularly as Brown-Forman inaugurated a "Chairman's Conference on Sustainability" as the book was published last fall. One suspects that story would also make a fascinating read — and offer helpful guidance to other corporately owned entities seeking to follow Fetzer's example. Maybe next book.

True to Our Roots: Fermenting a Business Revolution is available through the ***PWV*** Bookshelf for $27.95. ■

ASEV 2003 VITICULTURE PAPER

Sunlight and temperature effects on Merlot berries

BY S.E. Spayd,[a] J.M. Tarara,[b] D.L. Mee,[a] and J.C. Ferguson[b]

This article reports on a two-fold study conducted at the Irrigated Agricultural Research and Extension Center in Prosser, WA, which examined how the composition of Merlot grapes is affected by sunlight exposure and to separate, in situ, *the effects of temperature from solar radiation on the anthocyanin and phenol composition of Merlot grapes.*

Viticultural practices developed for climates with limited solar radiation are at times adopted in other regions with little consideration for the effects of excessive exposure of fruit to solar radiation. To achieve maximum color development in warm regions, prolonged exposure of clusters to sunlight should be avoided.[1]

With the advent of viticultural practices (for example, deficit irrigation, leaf removal, and reduced use of nitrogen fertilizer) that resulted in much more open canopies in eastern Washington, increased sunburning of fruit was observed, particularly on the west side of north/south-oriented rows and on the south side of east/west-oriented rows.

The relationship between sunlight exposure and temperature of grape clusters is important to berry composition and metabolism. Berry temperatures parallel the diurnal solar radiation curve.[21] Differences in temperature between ambient air and exposed fruit increased as solar radiation increased and wind speed decreased, as one might expect from heat transfer principles.

Solar radiation and wind velocity are the two most important determinants of fruit temperature in an energy balance approach.[26] During the day, shortwave radiation is the primary source of fruit warming, and convection is the primary source of heat transfer away from the cluster. Fruit size, reflectance of visible light, wind direction, and net long-wave radiation were less important. Shaded grape berries typically were 2.4°C above ambient, while "hot-spot" temperatures on tight and loose clusters were up to 12.4°C and 11.1°C above ambient, respectively.

Another study reported that sunlit leaves and clusters were 5°C to 10°C higher than shaded leaves and fruit.[15] In a third study, shaded clusters were cooler than sun-exposed clusters during the day, but were warmer than sun-exposed clusters at night, suggesting greater net radiation loss by the exposed berries at night.[5]

For red-fruited cultivars, shading of clusters decreased color and antho-

Color development of Merlot clusters on east-facing (photo top left) and west-facing (bottom right) sides of the same vine. Photos taken September 3, 2000.

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[b] Research Horticulturist and Electronics Technician, respectively; Horticultural Crops Research Unit, USDA-ARS.

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Synopsis:

Anthocyanin and phenolic profiles of berry skins from *Vitis vinifera* cv. Merlot in the Yakima Valley of Washington were influenced by sun exposure and temperature in 1999 and 2000. Growing degree days (base 10°C) accumulated between veraison and harvest were lower in 2000 than in 1999.

Total skin monomeric anthocyanin (TSMA) concentrations were higher in 2000 than in 1999 in any given treatment. Berry temperature was increased as much as 13°C above ambient and shaded cluster temperatures when clusters were exposed to sunlight, regardless of aspect for north/south oriented rows.

However, maximum fruit temperatures were higher for clusters on the west side of the canopy because ambient temperatures were higher after 12 noon. Temperatures of west-exposed clusters at times exceeded 40°C. East-exposed clusters had higher TSMA concentrations than west-exposed or shaded clusters.

To separate light and temperature effects, west-exposed clusters were cooled to the temperature of shaded clusters and shaded clusters were heated to the temperature of west-exposed clusters. Exposure to sunlight increased TSMA concentrations regardless of temperature in both years. In 1999 and 2000, cooling sun-exposed clusters increased TSMA concentrations. Heating shaded clusters decreased TSMA concentrations in 1999, but had no effect during the cooler ripening period of 2000.

Ultraviolet (UV) light barriers did not influence either cluster temperature or TSMA concentrations. Decreased TSMA concentrations in berry skins from west-exposed clusters were due to temperature and not to UV radiation.

Exposure to solar radiation increased concentrations of the 3-glycosides of quercetin, kaempferol, and myricetin. In 2000, sun-exposed clusters, regardless of aspect, had almost 10 times greater concentrations of total flavonols than shaded clusters. UV-light barriers significantly reduced individual and total flavonol concentrations, while temperature had little to no effect on their concentrations.

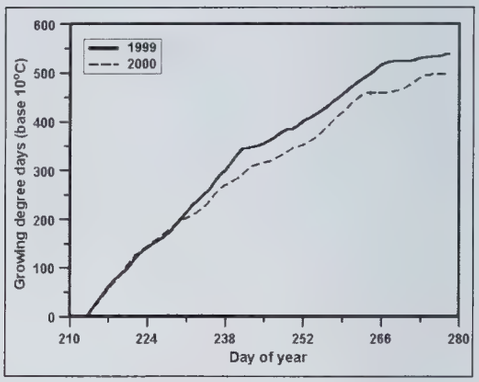

Figure 1: Growing degree-day accumulation (base 10°C) at WSU, Prosser, WA, from DOY 213 to 278, 1999 and 2000.

cyanin concentrations,[8,27] decreased soluble solids,[8,23] and increased titratable acidity.[8,23] Exposure to sunlight increased total phenol concentration in Pinot Noir skin disks, but did not affect anthocyanin concentrations.[22] Concentrations of quercetin glycosides were 10-fold greater in skin disks from sun-exposed berries than from shaded berries. The response of berry growth and physiology to light varies during fruit development.[6]

Effects of temperature on grape berry composition have been studied extensively — primarily in growth chambers, glasshouses, and phytotrons — to compare constant day and/or night temperatures.[3,6,14,15,16,17,20] In one phytotron study, cool day temperature (15°C) during ripening improved color development in Cardinal, Pinot Noir, and Tokay berries, while hot day temperature (35°C) significantly reduced or completely inhibited formation of anthocyanins.[16] A cool night temperature

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(10°C or 15°C) did not reverse the effect of hot day temperature on berry color.

Grapes from vines held at warm day (25°C) and cool night (15°C) temperatures developed less color than those from vines held at cool day and night temperatures (both 15°C). The higher anthocyanin content at the cooler temperatures was not related to juice soluble solids concentrations, which tended to be greater at the higher day temperatures.

In a glasshouse, berry color development for Cabernet Sauvignon was greater when day temperature was a constant 20°C than a constant 30°C, both with a constant night temperature of 15°C.[3] Soluble solids did not differ. At the higher day temperature, berries had higher proline and malate concentrations.

Separating the effects of temperature and sunlight on grape berry composition is difficult because many of the biochemical pathways are both light- and temperature-sensitive. In a phytotron study using container-grown vines, coloration of Pinot Noir grapes was always less under low [5.38 x 103 to 2.15 x 104 Lx(500 to 2000 ft-c)] than high [2.69 x 104 to 5.38

Table I. Gradients for separation of anthocyanins and flavonols from grape berry skin extracts.

1999		2000	
Time interval (min)	Proportion of eluant A in eluant B[a] (%)	Time interval (min)	Proportion of eluant A in eluant B[b] (%)
0 to 10	18 to 20	0 to 2	100
10 to 30	20 to 40	2 to 10	100 to 94
30 to 32	40 to 80	10 to 40	94 to 88
32 to 33	held at 80	40 to 60	88 to 75
33 to 36	80 to 18	60 to 64	75 to 10
		64 to 69	held at 10
		69 to 70	10 to 100

[a]Eluant A was 20% ultrapure water and 80% acetonitrile (v/v) containing 0.25 mL 85% phosphoric acid/L. Eluent B was 85% phosphoric acid diluted to 1.0 L with ultrapure water and adjusted to pH 1.5 as required.

[b]Eluant A was ultrapure water containing 0.25 mL 85% phosphoric acid/L, adjusted to pH 2.6 as required. Eluent B was 20% ultrapure water and 80% acetonitrile (v/v) containing 0.25 mL 85% phosphoric acid/L.

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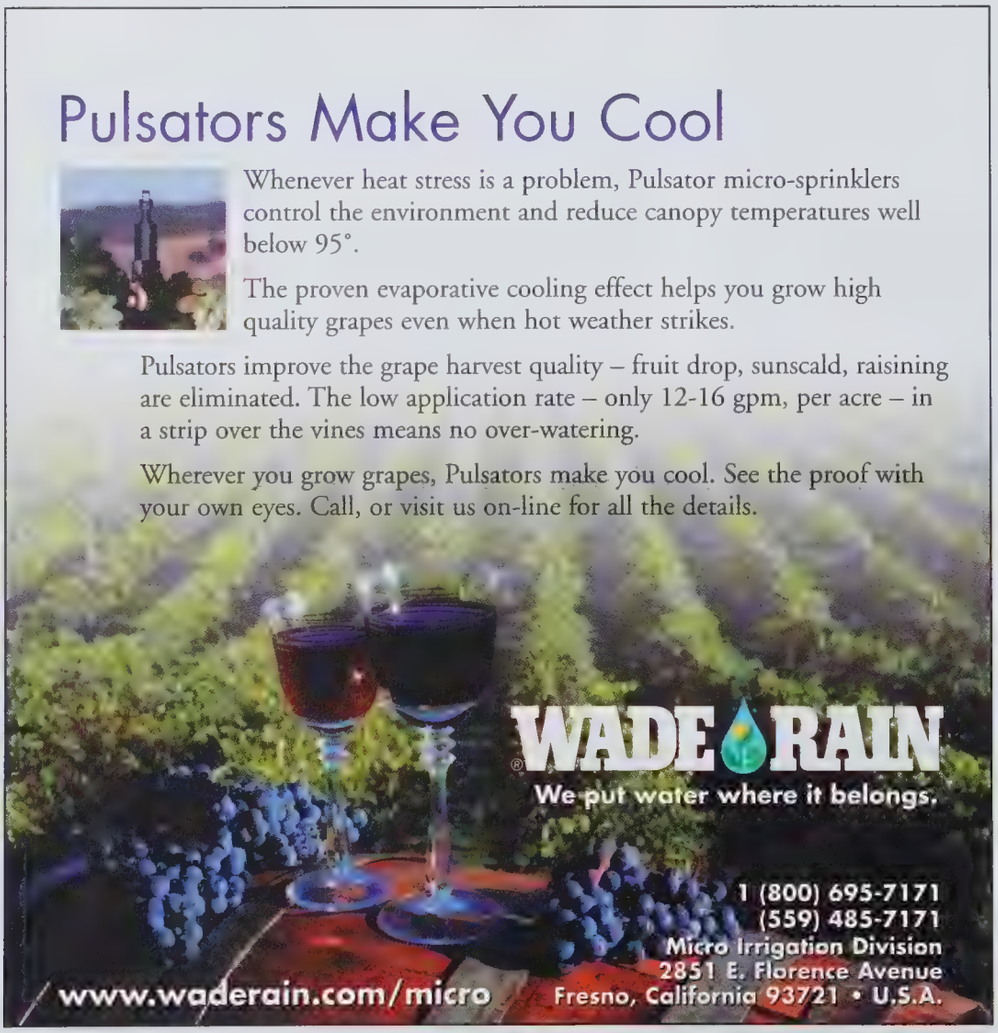
Table II. Temperature accumulation by clusters, expressed as growing degree days, as calculated from actual fruit temperatures using a base temperature of 10°C. Cumulative exposure to solar radiation determined from tube solarimeters placed in the fruiting zone.

Treatments	1999 Growing degree days (°C)		1999 Solar radiation (MJ/m^2)	2000 Growing degree days (°C)		2000 Solar radiation (MJ/m^2)
	Bunch closer to harvest[a]	Veraison to harvest[b]		Bunch closure to harvest[a]	Veraison to harvest[b]	
Sun						
Control	495	434	549	586	289	360
Blower	467	406	—	565	272	—
Cooled	442	385	—	519	252	—
Shade						
Control	439	382	129	521	250	69
Blower	443	385	—	551	266	—
Heated	505	443	—	602	297	—

[a]1999= 13 Aug to 12 Oct; 2000= 9 Aug to 25 Sept.
[b]1999= 20 Aug to 12 Oct; 2000= 23 Aug to 25 Sept.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x 104 Lx (2500 to 5000 ft-c)] light conditions at either a low (20°C) or a high (30°C) temperature.[14]

With a constant daytime temperature of 30°C, fruit temperatures were between 33°C and 35°C. Spectrophotometric measurements indicated a slight reduction in anthocyanin concentration in Pinot Noir berries grown at the higher temperature. Cardinal berry color was more sensitive to high temperature (less color) but less sensitive to light intensity than Pinot Noir. Daytime fruit temperatures of 32°C to 36°C nearly inhibited anthocyanin synthesis in Cardinal.

Materials and Methods

The study was conducted during 1999 and 2000 at the Irrigated Agriculture Research and Extension Center (IAREC) in Prosser, WA, (lat. 46.30°N, long. 119.75°W) within a 1.2-ha vineyard planted in 1983. The experimental plot was planted to *Vitis vinifera* L. cv. Merlot, comprising three rows of 13 vines each, oriented north-south. Vines were double-trunked, trained to a bilateral cordon at 1.2 m above ground, and spur-pruned. Each row was treated as a replicate (three replicates). Each cordon was treated independently of its mate in terms of sunlight exposure on the clusters.

Clusters of a given cordon were either shaded or sun-exposed by positioning shoots to the side of the canopy that was to be shaded. Shoots were brought over a "wind" wire (1.5 m) and tied to a catch wire (1.2 m) parallel to the cordon and wind wires. Because one layer of *V. vinifera* leaves will absorb 80% to 90% of incident solar radiation, this natural shading technique was expected to allow predominantly diffuse light to strike the shaded clusters.[25]

In 1999, berry samples were collected randomly twice after veraison from clusters that were 1) exposed to direct sunlight on the east side of the canopy, 2) exposed to direct sunlight on the west side of the canopy, 3) shaded from sunlight on the east side of the canopy, and 4) shaded from sunlight on the west side of the canopy.

No differences were found in the 1999 pre-harvest samples from shaded clusters. Therefore, fruit from east-shade and west-shade treatments were

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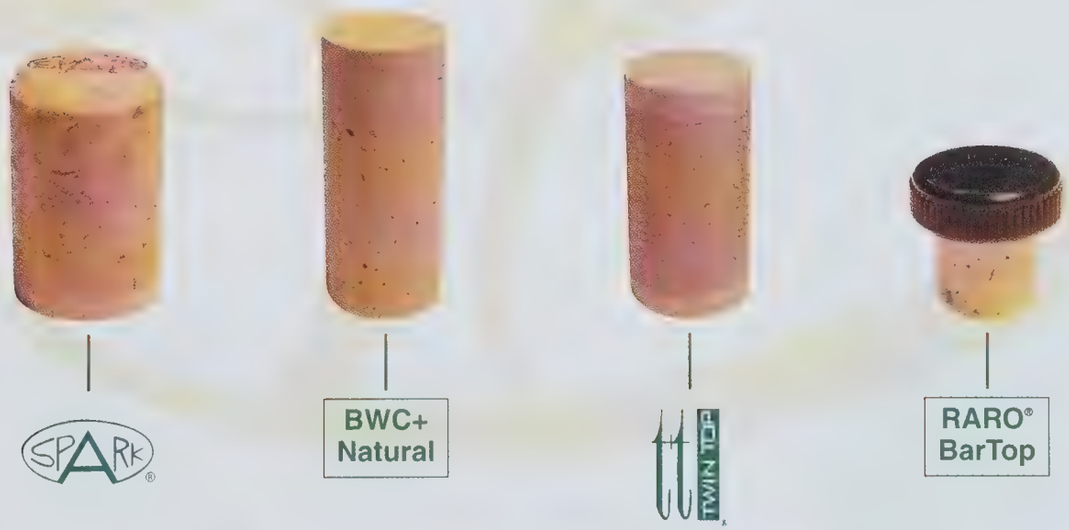

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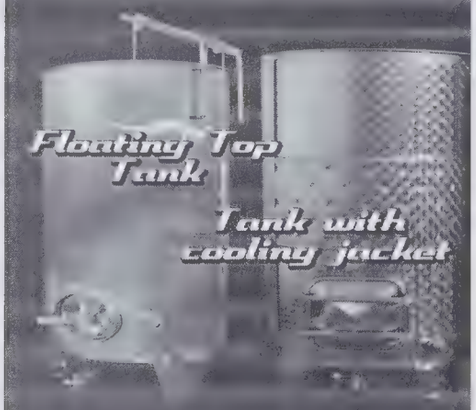

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Table III. Effect of sun exposure and temperature on Merlot berry composition at harvest, 1999 to 2000.

	Berry mass (g/berry)	Soluble solids (%)	TA (%)[a]	pH	Total color (AU/mL)[b]
		1999			
Treatment[c]					
Sun					
Control	1.00a[d]	23.2c	0.60c	3.59bc	16.2b
Blower	1.08a	24.1ab	0.64bc	3.61b	17.3b
Cooled	1.02a	24.4a	0.62bc	3.63b	21.7a
Shade					
Control	1.13a	23.8b	0.73a	3.56c	16.9b
Blower	1.00a	23.8b	0.66b	3.60bc	17.0b
Heated	1.06a	23.2c	0.59c	3.68a	12.5c
Cluster face[e]					
Exterior	1.03a	23.7a	0.63a	3.62a	16.8a
Interior	1.06a	23.8a	0.65a	3.60a	16.9a
		2000			
Treatment[f]					
Sun					
Control	1.32a	22.3ab	0.51cd	3.78bc	11.6b
Blower	1.23a	22.2ab	0.59bc	3.70c	14.3ab
Cooled	1.15a	23.0a	0.59bc	3.70c	15.2a
Shade					
Control	1.33a	21.2c	0.76a	3.73bc	10.7b
Blower	1.28a	22.3ab	0.65b	3.78b	13.1ab
Heated	1.27a	21.6bc	0.46d	3.89a	10.9b

[a]Expressed as tartaric acid.
[b]Absorbance at 520 nm of an acidified ethanol extract, pH 1.0.
[c]Means pooled across three repetitions and two cluster faces.
[d]Mean separation within columns within treatment, cluster face, and years by Duncan's new multiple range test ($p = 0.05$). Means followed by the same letter do not differ.
[e]Means pooled across three repetitions and six heating/cooling treatments.
[f]Means pooled across four repetitions.

not segregated in either subsequent samplings or at harvest. Only one pre-harvest sample was obtained in 2000 because a frost (–2.2°C) on September 23 curtailed the experiment.

In 2000, an additional fruit exposure treatment was added to determine the influence of ultraviolet radiation (UV). Acrylic sheets (0.9 m x 1.2 m x 3.75 mm thick) that either absorbed UV (98% below 400 nm; Acrylite OP-2, Cyro Industries, Mt. Arlington, NJ) or transmitted UV (Acrylite OP-1, Cyro Industries) were installed at a 45° angle, 0.5 to 0.8 m in front of west-facing, sun-exposed fruit. The sheets extended from just above the canopy to just below the fruiting zone. Cluster temperatures were recorded for four clusters per cordon (n=8 per screening material).

A temperature-stabilized UV-B sensor (280 to 320 nm; model CUV-B1, Kipp and Zonen) was used to determine the actual transmittance of the screening materials.

In situ *temperature control study*

All clusters used were on the west side of the canopy of three adjacent vines. Four clusters were monitored in 1999 and 2000 in each of six treatments: 1) sun-exposed (sun control); 2) shaded by shoots (shade control); 3) sun-exposed and chilled to the temperature of shaded clusters (sun-cooled); 4) shaded and heated to the temperature of sun-exposed clusters (shade-heated); 5) sun-exposed with ambient air blown on the cluster at same rate as chilled air (sun-blower); and 6) shaded with ambient air blown on the cluster at same rate as heated air (shade-blower). The sun-blower and shade-blower treatments served as controls for the effects of forced convection.

The system used for heating and cooling the clusters is described elsewhere.[28] Briefly, control clusters were used as "thermostats" to determine the temperature to which the treated clusters were to be heated or cooled. Shaded clusters set the temperature for sun-exposed, cooled clusters, while sun-exposed clusters set the temperature for shaded, heated clusters.

The temperature of the treated clusters provided feedback to the system to control delivery of heated or chilled air. Temperatures were controlled from around bunch closure to harvest. This period was from Aug 13 to Oct 12,1999 and from July 28 to Sept 24, 2000.

Because of the limited size of the experimental plot and the small number of clusters involved, fruit was sampled only when clusters were harvested. In 1999, clusters were divided along the vertical axis into exterior and interior faces. Berries from all clusters within a treatment were pooled and then divided into three repetitions for laboratory analysis. In 2000, each cluster was analyzed separately. Interior and exterior face berries were not segregated.

Micro-meteorological measurements

Several berries on individual clusters were used to estimate average cluster temperature and the difference between exterior and interior faces of the cluster. A four-junction, fine-wire (36 American Wire Gauge [AWG]) thermocouple (type T [copper-constantan]) wired in parallel was used as a unit for each measurement. Individual junctions (2 mm long) were manually inserted just beneath the berry skin at approximately the equator of the sphere.

Berries were selected from near the cluster shoulder and midway along its vertical axis. Before veraison, some berries developed necrosis around the thermocouple insertion hole. These junctions were moved to nearby berries on the same face of the cluster. After veraison, no necrosis was observed at the thermocouple entry points.

Ambient air temperatures inside the canopy and at 2 m above the canopy were measured by shielded, aspirated, fine-wire thermocouples (36 AWG; type T). Global irradiance was measured by a pyranometer. Irradiance at the fruiting zone was measured parallel to shaded and sun-exposed cordons by 1 m long tube solarimeters.

All signals were scanned at 10-second intervals and averaged every 12 minutes by a datalogger that also controlled multiplexers designed specifically for thermocouples.

Data were collected continuously for 60 days in 1999 and 58 days in 2000, approximately from bunch closure to harvest. Wind speed at 2 m was measured by a 3-cup anemometer at the Public Agriculture Weather System station at the IAREC facility. Signals

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were recorded every 10 seconds and averaged every 15 minutes.

Laboratory analyses

Fifty to 100 berries from each treatment were counted, weighed, and used for fresh berry analyses. Twenty berries were sub-sampled from each treatment and frozen at –35°C for future anthocyanin and phenol analyses. Rohapect D5-L enzyme was added to the equivalent of 1 mL of enzyme/kg of fresh berries. Berries were pureed in a laboratory blender at high speed for 1 minute.

The homogenate was filtered through fluted filter paper (no. 588, Schleicher and Schuell). The filtrate was used for determination of percent soluble solids, pH, titratable acidity (TA), and total color at 520 nm (TC520). Percent soluble solids was measured using a temperature-compensating Abbé refractometer.

The pH was measured with a pH meter standardized to pH 7.0 and 4.0. Titratable acidity was determined by titrating 5 mL of juice diluted with 100 mL of boiling distilled water to pH 8.2 with 0.1 N NaOH and was expressed as g tartaric acid/L.

For TC520, a 5 mL-aliquot of juice was diluted to a volume of 25 mL with acidified ethanol (pH 1.0). Absorbance was measured at 520 nm using a spectrophotometer. TC520 was calculated by multiplying absorbance at 520 nm by the dilution factor of five and expressed as absorbance units per mL of juice.

Ten frozen berries per sample were removed from the freezer the day of extraction and allowed to thaw slightly to facilitate removal of the skins. Whole skins were peeled from berries. Loose pulp was removed from the back of the skins by blotting with a Kim-Wipe.

Using an 8-mm diameter cork borer, two skin disks were removed from each berry for a total of 20 disks per sample, representing about 10 cm^2 of skin surface. Disks were placed in a 10-mL test tube to which were added 2 mL of 100% ethanol containing 0.2% HCl and homogenized. The homogenizer was rinsed with an additional 2 mL of acidified ethanol that were added to the 10-mL tube containing the homogenized grape skin.

Samples were placed in a refrigerator overnight (about 16 hours). The next morning, samples were centrifuged at 1200 x g for 15 minutes. The supernatant was transferred to a 10-mL volumetric flask.

Sample pellets were extracted two more times by mixing the pellet with 2 mL of acidified ethanol, holding for two hours under refrigeration, centrifuging, and transferring the supernatant to the 10-mL volumetric flask. Three milliliters of ultrapure water (18 MΩ) were added to each volumetric flask. The extract was taken to 10.0 mL with acidified ethanol.

A more exhaustive extraction performed (7 x 1 mL) on four of the samples

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Table IV. Influence of cluster temperature and exposure to sunlight on anthocyanin and flavonol concentrations in Merlot berry skins, 1999 to 2000.

	1999				2000					
	Sun		Shade		Sun			Shade		
	Control	Cooled	Control	Heated	Control	Blower	Cooled	Control	Blower	Heated
Total anthocyanins[a]	349.0ab[b]	436.2a	321.3b	228.9c	529.9b	597.7a	631.9a	414.7c	501.0b	415.2c
Delphinidin 3-glucoside[a]	60.1b	83.9a	59.9b	29.8c	110.7c[v]	132.0b	159.3a	75.6d	96.2c	54.6e
Cyanidin 3-glucoside[a]	17.9b	31.7a	16.8b	7.50c	39.0b	47.4b	60.7a	20.9c	22.6c	10.1c
Petunidin 3-glucoside[a]	39.3b	51.8a	37.3b	20.6c	63.2bc	71.8ab	80.8a	45.4d	56.3c	38.5d
Peonidin 3-glucoside[a]	31.1b	49.3a	29.8b	17.2c	45.0bc	53.2ab	60.4a	32.6de	35.6cd	22.0e
Malvidin 3-glucoside[a]	96.7ab	107.2a	84.0b	68.1b	135.8a	148.2a	138.4a	118.3a	142.0a	138.0a
Delphinidin 3-glucoside acetate[a]	11.5a	13.3a	12.0a	6.3b	18.4bc	22.0ab	24.2a	17.2c	20.3abc	12.5d
Cyanidin 3-glucoside acetate[a]	4.40a	5.53a	4.20a	2.10b	6.65ab	7.30ab	8.45a	4.45cd	5.52bc	2.90d
Petunidin 3-glucoside acetate[a]	10.5a	11.9a	10.3a	.10b	14.7a	15.8a	16.3a	13.5ab	16.0a	11.8b
Peonidin 3-glucoside acetate[a]	7.57ab	8.63a	7.37ab	5.60b	8.48a	9.08a	8.65a	7.82a	8.92a	8.30a
Malvidin 3-glucoside acetate[a]	32.1a	33.4a	28.5a	29.8a	44.5bc	45.0bc	37.3c	43.6bc	51.8ab	60.7a
Delphinidin/Cyanidin 3-glucoside coumarate[a]	6.10ab	7.27a	5.53b	5.13b	6.60a	7.28a	7.20a	4.00b	4.88b	4.25b
Petunidin 3-glucoside coumarate[a]	7.00a	7.00a	5.33ab	4.67b	7.98a	8.80a	7.38a	5.58b	7.40a	7.38a
Peonidin/malvidin 3-glucoside coumarate[a]	25.0a	25.7a	20.3a	25.0a	28.7b	30.1b	22.8b	25.8b	33.6b	44.1a
Total flavonols[c]	—[d]	—	—	—	82.7a	82.7a	76.0a	10.2b	22.9b	17.8b
Quercetin 3-glucoside[c]	22.0b	31.7a	7.13c	7.27c	59.9a	62.8a	56.6a	7.50b	14.6b	12.5b
Myricetin 3-glucoside[c]	—	—	—	—	9.12a	8.50a	8.15a	0.01b	3.15b	1.80b
Kaempferol 3-glucoside[c]	—	—	—	—	13.7a	11.4a	11.3a	2.68c	6.72b	4.80bc

[a]Expressed as µg malvidin 3-glucoside chloride/cm^2 skin; abbreviated TSMA in text.
[b]Mean separation within years within rows by Duncan's new multiple range test ($p = 0.05$). Means followed by the same letter do not differ.
[c]Expressed as µg quercetin 3-glucoside/cm^2 skin.
[d]Not determined in 1999.

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Table V. Effect of UV radiation on anthocyanin and flavonol concentrations in Merlot berry skins, 2000.

	Treatment		
		UV barriers	
	Control	Transmitting	Absorbing
Berry composition			
Berry mass (g)	1.23a[a]	1.25a	1.24a
Soluble solids (%)	22.9a	22.2a	22.0a
Titratable acidity (%)[b]	0.55a	0.48b	0.53ab
pH	3.64b	3.78a	3.75ab
Total color[c]	11.8a	9.6b	8.4b
Skin anthocyanins and flavonols			
Total anthocyanins[d]	592.6a	551.0a	561.8a
Delphinidin 3-glucoside[d]	132.4a	108.3a	108.3a
Cyanidin 3-glucoside[d]	54.0a	33.6ab	31.9b
Petunidin 3-glucoside[d]	69.9a	63.6a	63.6a
Peonidin 3-glucoside[d]	54.6a	43.1b	30.6b
Malvidin 3-glucoside[d]	135.1a	148.7a	151.8a
Delphinidin 3-glucoside acetate[d]	22.2a	19.8a	21.3a
Cyanidin 3-glucoside acetate[d]	8.98a	5.6b	5.6b
Petunidin 3-glucoside acetate[d]	16.0a	14.6a	15.3a
Peonidin 3-glucoside acetate[d]	10.0a	9.0a	9.0a
Malvidin 3-glucoside acetate[d]	43.7a	50.6a	49.3a
Delphinidin + cyanidin 3-glucoside coumarate[d]	7.2a	5.8ab	4.7b
Petunidin 3-glucoside coumarate[d]	8.2a	8.9a	8.0a
Peonidin + malvidin 3-glucoside coumarate[d]	30.6b	39.2a	36.6ab
Total flavonols[e]	71.3a	67.0a	40.8b
Quercetin 3-glucoside[e]	52.9a	50.2a	31.2b
Myricetin 3-glucoside[e]	7.4a	6.3a	1.9b
Kaempferol 3-glucoside[e]	11.0a	10.5a	7.7b

[a]Mean separation within rows by Duncan's new multiple range test ($p = 0.05$). Means followed by the same letter do not differ. Means were pooled across four repetitions.
[b]Expressed as tartaric acid.
[c]Absorbance at 520 nm of an acidified ethanol extract, pH 1.0.
[d]Expressed as µg malvidin 3-glucoside chloride/cm^2 skin; abbreviated TSMA in text.
[e]Expressed as µg quercetin 3-glucoside/cm^2 skin.

indicated that 97% of the anthocyanins and flavonols were extracted using the triple extraction described above (data not presented). Samples were stored under nitrogen headspace at –5°C. At the time of analysis, extracts were thawed at room temperature (ca. 20°C) and diluted 1:1 with ultrapure water.

All HPLC hardware was controlled by proprietary software. The system consisted of three pumps (model SD-200), an autosampler (model AI-1A), a photodiode array detector (PDA; model PDA-1), and a fluorescence detector (model FL-2). Column temperature was maintained at 35°C for all separations.

The method of Lamuela-Raventos and Waterhouse was used for the 1999 grape skin extracts.[19] The column was a Waters Novapak C18 (3.9 x 150 mm) with 4 mm particle size and a guard column of the same packing.

In 2000, eluant A was omitted because flavonoids and anthocyanins were the only phenols identified from the 1999 skin extracts (Table I). Additionally, the eluant ramp for B and C was adjusted and column length was increased to 250mm for improved peak separation. Concentrations of monomeric anthocyanins and total monomeric anthocyanins were expressed as µg malvidin 3-glucoside/cm^2 skin.

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Experimental design and statistical analyses

For the cluster location study, the design was randomized, complete block with rows as replicates for all berry samples (3 replicates x 3 cluster locations). Pre-harvest berry samples taken on more than one date were treated as a split-plot in time where appropriate. Data were subjected to analysis of variance using the general linear model, F-tests, orthogonal polynomial regression, stepwise multiple regression, and Duncan's new multiple range test (p = 0.05) using SAS.

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Results

At the IAREC, growing degree-day (GDD) accumulations from April 1 to October 31 (base temperature 10°C) were 1247 in 1999 and 1384 in 2000. The average GDD for the period 1955 to 2000 was 1389.

The pattern of GDD accumulation differed between years. In 1999, GDD accumulation was slow from April through July, the third lowest during the period 1955 to 1999. During the same period in 2000, GDD accumulation was the twelfth highest between 1955 and 2000. Conversely, between August 1 and harvest, the trend was reversed between the two years, with 2000 cooler than 1999 (Figure I). Temperatures for this period were warmer than average in 1999 and lower than average in 2000.

In situ *temperature control study*

Fruit temperature accumulation was greater from bunch closure to harvest in 2000 than in 1999 (Table II). Between initiation of veraison for east-exposed clusters, and harvest there were 54 days in 1999 and 33 days in 2000.

Generally, temperature accumulations by heated and cooled clusters reflected the temperature regimens we were trying to achieve. Temperature accumulations of cooled, sunlit clusters were within 3 GDD of shaded clusters in both growing seasons. Shade-heated clusters were within 14 GDD of sunlit control clusters for both years and measurement periods.

In both years, temperature accumulations for the shade-blower and sun-blower fruit were intermediate to their control and temperature-manipulated counterparts. During the 1999 ripening period, minimum berry temperatures ranged from –1.2°C to +0.4°C, which occurred before dawn on either September 29 or October 3.

In 2000, a frost occurred on the night of September 23/24. Air temperature was below 0°C for 3.8 hours with the minimum air temperature reaching –2.4°C. Minimum berry temperatures ranged from –2.1°C to –3.6°C and were below 0°C for 3.4 to 4.0 hours.

Ambient global irradiance accumulated from veraison to harvest was 1,007 MJ/m² in 1999 and 643 MJ/m² in

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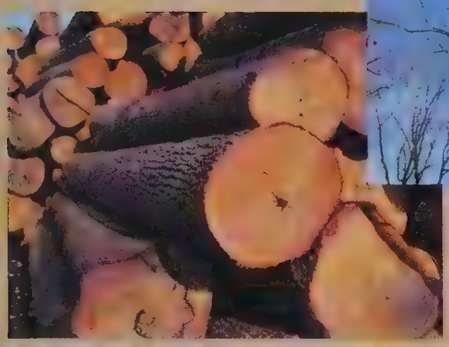

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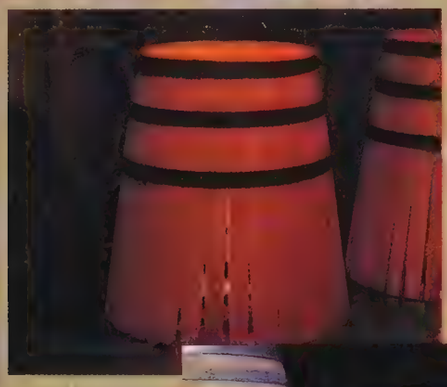

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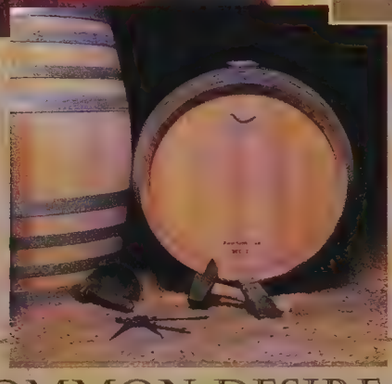

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Table VI. Influence of cluster position on accumulation of growing degree hours and days based on Merlot berry temperatures between initiation of monitoring (ca. bunch closure) and harvest and between veraison and harvest in 1999 and 2000 (10°C used as base temperature).

Cluster position	Start of monitoring to harvest		Veraison to harvest	
	Degree hours (°h)	Degree days (°d)	Degree hours (°h)	Degree days (°d)
	1999			
	13 Aug to 12 Oct		*20 Aug to 12 Oct*	
East exposed	12,422	504	10,617	442
East shaded	10,422	434	9,089	379
West exposed	11,821	493	10,407	434
West shaded	10,554	440	9,227	384
	2000			
	9 Aug to 25 Sept		*23 Aug to 25 Sept*	
East exposed	10,015	417	7,399	308
East shaded	8,852	369	6,507	271
West exposed	9,979	416	7,441	310
West shaded	8,935	372	6,603	275
UV pass	9,913	413	7,360	307
UV block	9,739	406	7,219	301

2000. The difference in accumulated irradiance was due to the difference in the length of time between veraison and harvest in the two years.

Solar radiation exposure at the fruiting zone of exposed clusters was about 60% of ambient, whereas about 10% of ambient levels of solar radiation were incident on shaded clusters (Table II). Between August 19 and September 21, corresponding to the veraison-to-harvest period in 2000, cumulative solar radiation exposure was similar in both years (data not shown).

Neither temperature nor exposure to sunlight affected berry mass within either year, but berry mass was greater in 2000 (Table III). Although there were some differences in soluble solids among the six temperature-sunlight treatments, there were no consistent patterns. Whether based on juice concentration or per berry (data not shown), the TA of sun-control berries was higher in 1999 than in 2000, while it was similar in concentration between the two years for shade-control berries.

In both years, sun-cooled fruit had the highest mean concentration of soluble solids, but this treatment did not differ from the other two sunlit treatments. Also in both years, shade-heated and sun-control berries had the lowest TA, and shade-control berries had the highest. The TA did not differ among any of the sunlit treatments in either year. The TA of shade-blower fruit was lower than shade-control fruit and higher than shade-heated fruit; it was similar to that of sun-blower and sun-cooled fruit. Fruit pH was inversely related to TA.

In 1999, sun-cooled clusters had the highest and shade-heated clusters the lowest TC520 of the six *in situ* temperature control treatments (Table III). TC520 was lower, and differences in TC520 among treatments were not as great in 2000 as in 1999. Lower TC520 in 2000 may have resulted from higher berry mass. Trends indicated that shade-control, shade-heated, and sun-control clusters had the least TC520, while sunlit-cooled clusters had the most TC520.

In 1999, cluster "face" had no effect on berry composition, whether or not the cluster was shaded or sunlit. Because TC520 did not differ in 1999, the following procedures were followed: 1) In 1999, berries from the exterior and interior cluster "faces" were pooled for individual anthocyanin determinations, and 2) individual anthocyanins were not determined for sun- and shade-blower treatments; and 3) in 2000 no differentiation in cluster "face" was made.

Although the TC520 of juice from a whole berry macerate was greater in 1999, total anthocyanin concentrations in skin extracts were about 50% higher in 2000 (data not shown), suggesting the dilution of TC520 in the whole berry extracts due to larger berry mass (Table III).

Total monomeric skin anthocyanins (TSMA) were affected by sunlight and temperature in both years, but not to the same degree (Table IV). Of the four treatments in 1999 and six treatments in 2000, sun-cooled clusters tended to have the highest TSMA concentrations.

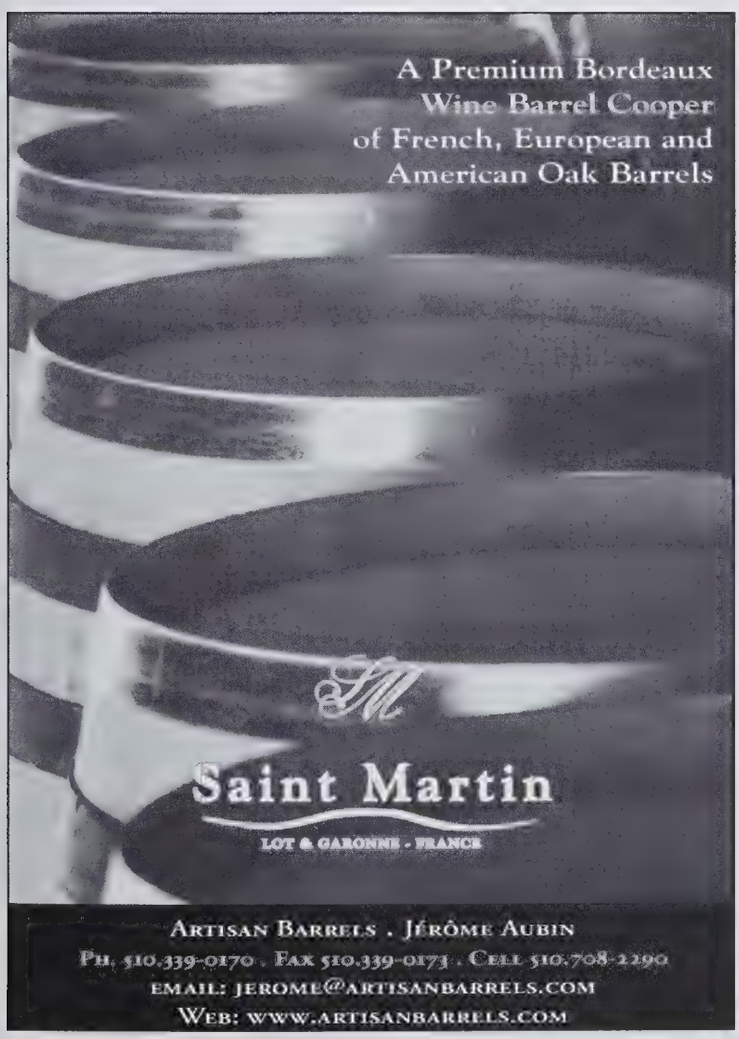
In 1999, shade-heated clusters had the lowest TSMA concentrations of the four treatments. In 2000, three shade-cluster treatments tended to have the lowest TSMA concentrations. However, shade-blower clusters did not differ from sun-control clusters.

The effects of temperature on TSMA concentration were examined by comparing the difference in concentration between treatments within each of the light conditions. In 1999, for sun-exposed clusters, anthocyanin concentration was 87 µg/cm² skin higher in cooled clusters than in the control clusters. For shaded clusters, TSMA concentration was 92 µg/cm² skin higher in non-heated, control clusters than in heated clusters. Therefore, under both light conditions, differences in TSMA concentrations between the control and the temperature-modified clusters were about 90 µg/cm² skin. This value represents the influence of temperature on TSMA concentration.

Similarly, we compared the effects of light on TSMA concentration by

Table VII. Number of hours Merlot berry temperature exceeded selected temperature thresholds from about bunch closure to harvest, 1999 to 2000.

Cluster position	Threshold temperature (°C) >30°	>35°	>40°
1999 *(1437 total hours of monitoring from 13 Aug to 12 Oct)*			
East exposed	148.2	3.2	0.0
East shaded	53.2	0.0	0.0
West exposed	181.4	73.6	2.8
West shaded	83.0	0.0	0.0
2000 *(1094 total hours of monitoring from 9 Aug to 25 Sept)*			
East exposed	114.6	7.6	0.0
East shaded	45.0	2.6	0.0
West exposed	149.6	67.4	2.6
West shaded	61.0	2.6	0.0



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East-facing canopy clusters either heated to the temperature of west-facing canopy clusters (left) or cooled to shaded cluster temperatures (right) in 2002. Photo by J. Ferguson.

comparing the difference in concentration between treatments within each of the temperature regimes. For the high-temperature clusters, TSMA concentration was 120 μg/cm² skin higher in light-exposed clusters than in shaded-heated clusters. For the cooler temperature clusters, TSMA concentration was 115 μg/cm² higher in sun-cooled clusters than in shade-control clusters.

Under both temperature conditions, differences in TSMA concentration between sunlit and shaded clusters of the same temperature averaged 117 μg/cm² of skin, representing the influence of light on TSMA concentration.

In sun-exposed clusters (2000 harvest), the TSMA concentration was 102 μg/cm² of skin higher for cooled clusters than the control clusters. For shaded clusters, heating clusters had no effect on TSMA concentrations (Table V).

Again, the effects of light on TSMA concentration were compared by noting the difference in concentration between treatments within each of the temperature regimes. For the high-temperature clusters, TSMA concentration was 115 μg/cm² of skin higher in exposed clusters than in shade-heated clusters. For the cool-temperature clusters, TSMA concentration was 217 μg/cm² skin higher in sun-cooled clusters than in shade-control clusters.

In 1999, the response of individual anthocyanins to light and temperature treatments tended to follow the pattern of TSMA concentration, with lower individual pigment concentrations in berry skins that were exposed to higher temperatures or were shaded.

These trends were not as clear in 2000 as in 1999, although sun-cooled clusters tended to have the highest concentration of pigments. Using stepwise multiple regres-

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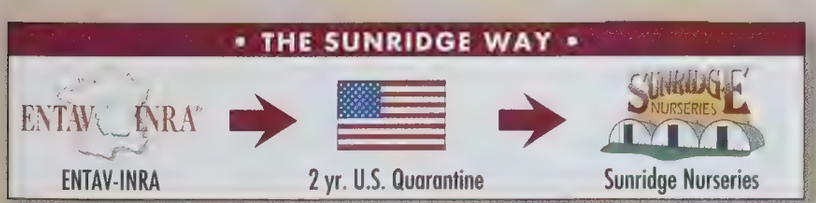

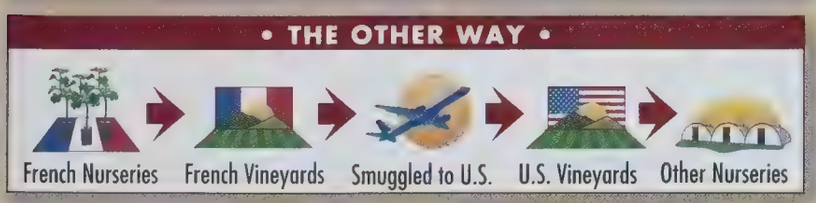

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sion, 92% of the variability in total anthocyanin concentration in the skins was accounted for by petunidin 3-glucoside.

Skins from sun-exposed clusters had 3X to 4.5X higher concentrations of quercetin 3-glucoside than skins from shaded clusters. Although sunlight was the overriding factor influencing quercetin 3-glucoside concentrations, cooling the sun-exposed clusters increased quercetin 3-glucoside concentrations by about 40% in 1999.

In 2000, quercetin 3-glucoside concentrations were 4X to 8X greater in skins from sun-exposed clusters than those from shaded clusters. Kaempferol 3-glucoside was 1.5X to 5X greater in skins from sun-exposed than shaded clusters. Cluster temperature did not affect concentration of the three flavonols in 2000.

UV barriers

Berry temperatures behind the UV-blocking and UV-passing screens were not measurably different from those of unscreened, west-exposed fruit. Thus, any effect of the screening materials on fruit composition was not due to differences in fruit temperature. The UV-absorbing acrylic material transmitted an average of 4.2% of UV-B over the course of a day, whereas the UV-transmitting material transmitted only 56% of incident UV-B (data not shown). Incident UV-B at the fruiting zone averaged 88% of the ambient (sky) value.

Blocking the UV waveband from sun-exposed clusters on the west side of the canopy did not affect berry mass or soluble solids (Table V). The effects of the two barriers on TA and pH were not consistent, while TC520 of the acidified ethanol extract was reduced as compared to the control. However, TSMA concentrations did not differ between the two UV panels and the control clusters. Some of the individual anthocyanins were affected by UV screening. Concentrations of the 3-glucosides of quercetin, myricetin, and kaempferol were greatly reduced when UV radiation was blocked from the clusters.

Cluster location: Fruit temperature

Of the three cluster locations (east-exposed, west-exposed, and shaded), absolute fruit temperatures were highest on the east side before solar noon and highest on the west side after solar noon. East-exposed fruit warmed earlier in the day than west-exposed fruit and remained near ambient shade temperatures during the afternoon.

Grape berries exposed to sunlight were warmer than berries shaded from sunlight by the grapevine canopy. The maximum daily differences in temperature (ΔT_{max}) between east-exposed and shaded berries ranged from 3.3° to 11.7°C (between 6.0° and 10.7°C in 2000) on days with clear skies, and generally occurred between 0800 and 1000 hr LST. This sizable range on days with similar irradi-

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ance was due to variations in wind speed, with more effective convection away from the exposed clusters than from those in the relatively calm interior of the canopy (data not shown).

Daily ΔT_{max} between west-exposed and shaded berries was 2.5° to 9.2°C (between 3.8° and 9.7°C in 2000) on days with clear skies. Again, the variability in ΔT_{max} under similar irradiance was due to differences in convection (wind speed). Generally, ΔT_{max} occurred between 1400 and 1600 hr LST.

In both years, on days with clear skies, the exposed berries on either side of the canopy were 4° to 13°C warmer than ambient air at reference height at the time of daily ΔT_{max} (data not shown). Only the time of ΔT_{max} differed; its magnitude was similar for the two sides of the canopy.

An indicator of fruit exposure to heat was constructed by calculating GDD from berry temperatures at each cluster location (Table VI). In both years, between bunch closure and har-

Table VIII. Main effects of sample date and cluster position on berry mass and composition of Merlot, 1999 and 2000.

	Berry mass (g/berry)	Soluble solids (%)	TA (%)[a]	pH	Total color (AU/mL)[b]
1999					
28 Sept	1.23a[c]	22.2b	0.74a	3.43b	13.9b
7 Oct	1.19a	23.6a	0.72a	3.61a	16.8a
Cluster position					
East exposed	1.27a	23.0ab	0.71b	3.50b	18.4a
East shaded	1.29a	23.3a	0.81ab	3.49b	16.7ab
West exposed	1.15b	22.5b	0.59c	3.62a	11.6c
West shaded	1.14b	22.9ab	0.82a	3.46b	14.7b
2000					
21 Sept	1.45a	23.4a	0.67a	3.59b	15.6a
26 Sept	1.29b	22.4b	0.60b	3.65a	14.3b
Cluster position					
East exposed	1.47a	23.2a	0.61b	3.61b	18.0a
Shaded	1.35a	22.4b	0.76a	3.55c	13.2b
West exposed	1.30a	22.7ab	0.52c	3.71a	13.7b

[a] Expressed as tartaric acid.
[b] Absorbance at 520 nm of an acidified ethanol extract, pH 1.0.
[c] Mean separation within columns within year within main effect by Duncan's new multiple range test ($p = 0.05$). Means followed by the same letter do not differ.

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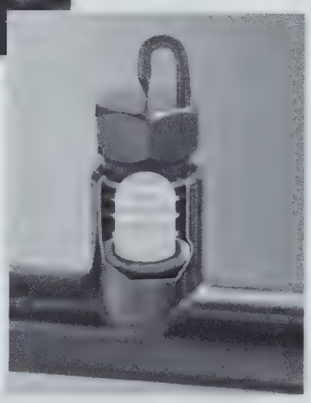

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vest or between veraison and harvest, there was little difference (~2%) in the accumulation of GDD between east- and west-exposed clusters. Shaded clusters consistently accumulated fewer GDD than sun-exposed clusters. Clusters screened by the UV materials accumulated similar numbers of GDD as unscreened, west-exposed clusters.

Accumulated temperature, although an important indicator, may not be as critical to fruit physiology as the length of time the berries are subjected to specific temperatures. Threshold temperatures of 30°, 35°, and 40°C were selected to determine differences in high temperature duration among the four cluster exposures (Table VII).

The number of hours above 30°C was less in 2000 than in 1999 for all cluster locations. During both growing seasons, east-shaded clusters experienced the lowest number of hours at temperatures greater than 30°C, while west-exposed clusters had the highest number of hours.

Perhaps the greatest differences in fruit temperatures among the four cluster locations were in the number of hours above 35°C. In both years, west-exposed clusters were above 35°C for more than 65 hours between bunch closure and harvest, while clusters in the other three locations were above 35°C for no more than 7.6 hours. Of the four locations, only west-exposed clusters reached temperatures greater than 40°C in either year.

Cluster location: Pre-harvest berry composition

In 1999 and 2000, sample date and cluster location influenced berry composition in the pre-harvest samples. There were no interactions between sample date and cluster location (data not shown). Therefore, only the main effects will be presented. Berry mass decreased between sampling dates in both 1999 and 2000 (Table VIII).

In 1999, soluble solids, pH, and TC520 increased, while TA did not differ between sampling dates. In 2000, soluble solids, TA, and TC520 were lower on September 25 than on September 21. The decrease in soluble solids and TC520 probably resulted from several hours below 0°C on September 23 that damaged the fruit, forcing harvest on September 25. In 1999, berries on the west side of the canopy weighed less than berries on the east side.

Shaded berries on the west side tended to have lower soluble solids than their east-side counterparts, but the maximum difference in soluble solids among all cluster locations was only 0.8%.

The TA was highest in shaded fruit, followed by east-exposed fruit, with the lowest concentration in west-exposed fruit.

West-exposed fruit had the highest pH of the four cluster locations. TC520 was highest for east-exposed and lowest for west-exposed clusters.

In 2000, shaded clusters were sampled from both sides for a combined shaded fruit sample. Cluster location did not affect berry mass.

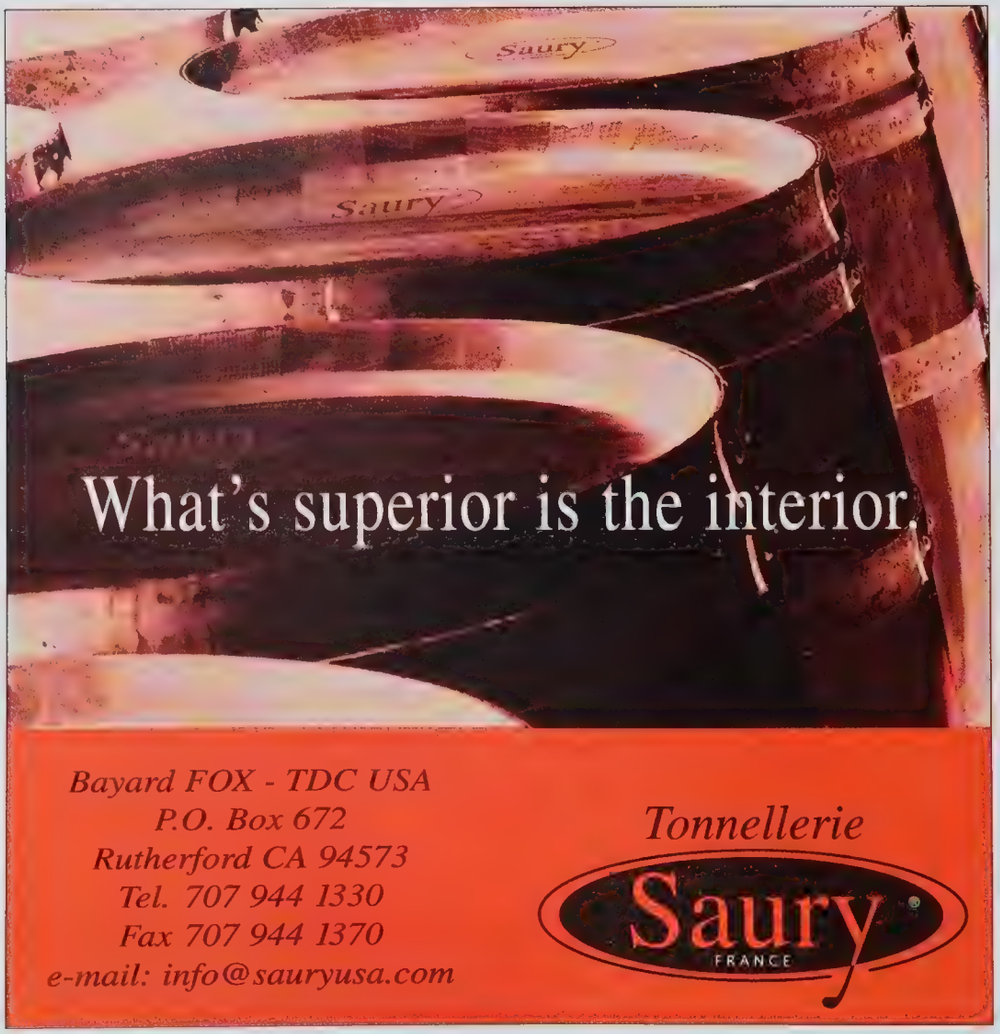
As in 1999, the maximum difference in soluble solids was 0.8% among all cluster locations, with east-exposed fruit having the highest and shaded fruit having the lowest concentrations.

The TA reflected berry temperatures. Shaded berries had the highest TA followed by east-exposed berries.

Berry pH was inversely related to TA. TC520 was highest in east-exposed fruit with no difference in TC520 between shaded and west-exposed fruit.

On September 5, 2000, on the same vine, based on berry color, west-exposed clusters apparently were still in the early stages of veraison, while most east-exposed clusters were fully colored. This extreme difference was not noticed in 1999. Pre-veraison temperatures in 2000 were warmer than during the same period in 1999.

Merlot berry skins were analyzed for changes in the distribution of individual anthocyanins on each of the two pre-harvest sample dates, and on the day of harvest in 1999, and on one pre-



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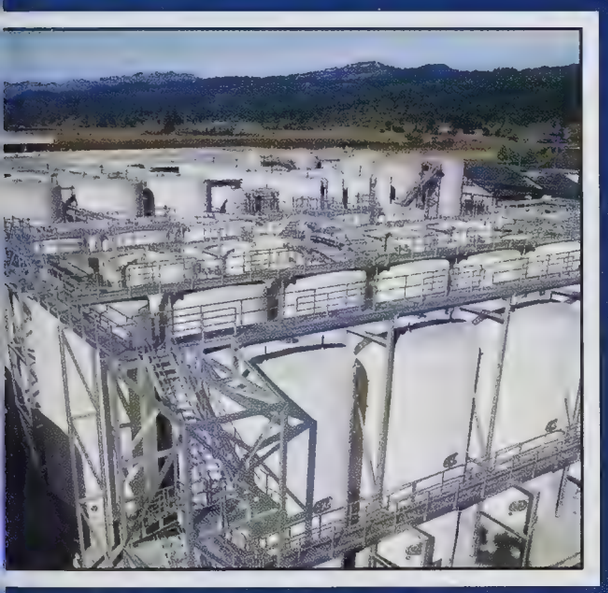

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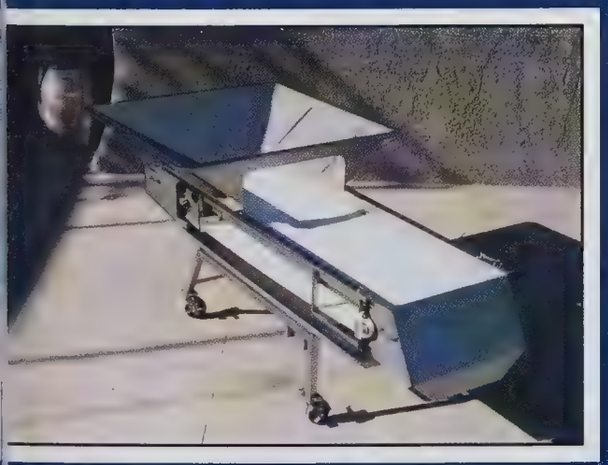

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harvest sample date in 2000. In 1999, cluster location contributed more to the variability in concentration of individual monomeric anthocyanins and TSMA concentrations in skin tissue than did the sampling date.

There were no significant interactions between sampling date and cluster location. With means pooled across cluster location, malvidin 3-glucoside was the only non-substituted anthocyanin to increase in concentration during the sampling period. In 1999, TSMA concentration tended to increase with time.

In 1999, TSMA concentration differed among cluster locations, with concentration decreasing from east-exposed to shaded to west-exposed clusters. East-exposed clusters had the highest concentrations of each of the non-substituted anthocyanins, while west-exposed clusters had the lowest concentrations. Shaded clusters were intermediate to east- and west-exposed clusters, with the exception of malvidin 3-glucoside, where shaded and west-exposed clusters had similar skin concentrations.

In 2000, concentrations of TSMA and several of the individual anthocyanins were highest in the berry skins of east-exposed clusters, while shaded and west-exposed clusters did not differ.

In both 1999 and 2000, quercetin 3-glucoside concentration was lowest in the skins of shaded berries. In 2000, we tentatively identified a derivative of myricetin, based on retention time, and confirmed the presence of kaempferol 3-glucoside. Both of these flavonols responded to sunlight exposure in the manner of quercetin 3-glucoside. Total flavonol concentration was almost 10 times greater in skins of sun-exposed than shaded clusters, regardless of aspect.

Combined light and temperature effects

Forward selection, step-wise multiple regression was used to develop a model for factors contributing to anthocyanin accumulation in berry skins. Mean TSMA concentrations from the *in situ* and the cluster location studies were regressed against their corresponding veraison-to-harvest GDD accumulations, accumulated solar radiation, and hours that the fruit temperature exceeded 30°, 35°, and 40°C.

For the cluster location study, the day of harvest sample in 1999 and the pre-harvest sample in 2000 were used in the regression. To be retained in the model, the contribution of a variable had to be significant at $p \leq 0.15$.

Across the two years and two studies, GDD between veraison and harvest was the first independent variable added to the model. It accounted for about 45% of the variability in TSMA concentrations.

Accumulated solar radiation (partial $r^2=0.306$) was the second variable added, giving a model that accounted for 76% of the variability in TSMA concentrations ($r^2=0.758$). Number of hours above 35° and 30°C were included in the final model, in that order. However, these variables accounted for far less variability than GDD and accumulated solar radiation (partial r^2-values of 0.046 and 0.076, respectively).

The final model generated was: TSMA=869 + (–1.88*GDD) + (1.67*SR) + (–3.24*H35) + (1.67*H30); where TSMA is total skin monomeric anthocyanin concentration ($\mu g/cm^2$); GDD is growing degree days (base 10°C) from veraison to harvest; SR is accumulated solar radiation (MJ/m^2) from veraison to harvest; H35 is hours above 35°C; and H30 is hours above 30°C. The final model accounted for 88% ($p = 0.006$) of the variability in TSMA concentration.

Recognizing that interrelations exist among the four independent variables, the model was tested for collinearity. The condition index for the model was 15.9. Therefore, although the variables are physically related, their biological effect on anthocyanin concentration had a low degree of collinearity.

Discussion

In the present study, sunlight influenced grape berry composition through at least two mechanisms: temperature and solar radiation. Visual evidence of sunburn, browning, or russeting of berry skins was observed on clusters exposed to sunlight on the west side of north-south oriented rows.

Berry temperatures exposed to sunlight on either side of the canopy were elevated above ambient to the same degree. However, actual berry temperatures were higher on sun-exposed clusters on the west side due to the normally higher ambient temperatures that occurred after solar noon. Shaded berries were at ambient temperature. Maximum berry and ambient temperatures occurred about 4 PM.

Varying magnitudes of temperature elevation due to exposure to sunlight were reported in other studies.[1,13,15,21,23,26] With sun exposure, the temperature (12.4°C) of tight clusters increased above ambient more than did loose clusters (11.1°C).[26] A maximum increase over ambient of 15.7°C was recorded,[26] while we recorded a maximum increase above ambient temperature of 12.3°C in 1999 and 13.0°C in 2000.

Merlot clusters in our study were relatively loose. In east-west oriented rows, mid-day berry temperatures of south-exposed clusters were 3° to 4°C higher than north-exposed clusters.[1] Sunburn has been observed in eastern Washington on south-exposed clusters in east-west oriented rows.

To support the effects of temperature and light on phenol components, we focused in part on some basic berry measurements (berry mass, soluble solids, TA, and pH). Our data regarding the effect of temperature and light on these measurements did not conflict with previous reports.[8,13,14,17,23]

Shaded and exposed berries differed little in mass in our study even though cluster exposure treatments were imposed during Stage I (pea size) of berry growth. Heat stress of Napa Gamay vines during Stage I and Stage II of berry growth resulted in greater loss of berry mass than heat stress during Stage III.[20]

Crippen and Morrison reported shade berries of Cabernet Sauvignon were heavier and larger than sun-exposed berries.[5] Of the fruit components measured, percent soluble solids was perhaps the least affected by either exposing/shading clusters from sunlight or artificially altering cluster temperature. This was in agreement with Crippen and Morrison, who did not differentiate between east- and west-exposed clusters.[5]

Reynolds and co-workers reported that soluble solids of east- and west-exposed clusters were higher than partially and fully-shaded clusters.[23] North-exposed clusters of Cabernet Sauvignon were found to have lower

soluble solids than south-exposed clusters at a given level of mid-day PAR.[1]

In general, TA between the various treatments was inversely related to the overall temperature to which a treatment was subjected: the greater the heat summation, the lower the acidity. However, pre-veraison temperatures and post-veraison alteration of conditions that influenced fruit temperatures apparently influence TA, as concentrations were higher in 1999 than in 2000. GDD accumulation in 1999 was lower pre-veraison and higher post-veraison than in 2000.

Fruit pH was inversely related to TA. For Seyval blanc, TA was higher pre-veraison and lower post-veraison in exposed clusters than shaded clusters with malate concentrations paralleling TA.[23] The pattern of differences in TA and pH between south-exposed and north-exposed Cabernet Sauvignon clusters reported by Bergqvist et al.[1] paralleled differences observed in the present study.

Light and temperature effects on anthocyanins and phenols, primarily flavonols, in berry skins were the focus of our study. Lower anthocyanin concentrations found in skins from west-exposed clusters appear to be due to elevated temperature either through degradation, inhibition of synthesis, or, more likely, both. This is supported by the measured increase in skin anthocyanins when west-exposed clusters were chilled to the temperature of shaded fruit.

Temperature had little to no effect on flavonol concentrations. Light increased total concentration of monomeric anthocyanins and flavonols. UV-light stimulated flavonol biosynthesis as evidenced by the decreased concentration in skins of berries shielded by UV-barriers from bunch closure to harvest.

The UV-barriers did not affect total monomeric anthocyanin concentrations. Roubelakis-Angelakis and Kliewer reported that total phenol accumulation in Cardinal berry skins responded differently to light and temperature than did anthocyanin accumulation.[24] The authors suggested that, in grape berry skins, there is independent regulation of these two pools. However, one must consider that anthocyanins and flavonols share the flavonoid biosynthetic pathway to the point of formation of dihydroflavonols.[18]

Concentration of the quercetin aglycone was decreased by UV-restriction, as were the glycosylated forms of quercetin, kaempferol, and myricetin. There was no apparent proportional inhibition of biosynthesis of the glycosylated forms of the anthocyanins.

As revealed in our study, inhibition of biosynthesis in grape berry skins of quercetin and the 3-glycosides of quercetin, kaempferol, and myricetin before formation of dihydrokaempferol and/or dihydroquercetin due to restriction of UV is unlikely, as anthocyanin biosynthesis was not inhibited. Therefore, for at

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least some period during grape berry ripening, UV is required to stimulate gene transcription for production of flavonol synthase (FLS). FLS catalyzes the conversion of dihydromyricetin to myricetin, dihydrokaempferol to kaempferol, and dihydroquercetin to quercetin.[11]

Leucoanthocyanidins are formed from dihydroflavonols in the next step of the anthocyanin biosynthetic pathway.[18] In our study, it was unlikely, but not impossible, that there were sufficient concentrations of leucoanthocyanins to sustain anthocyanin synthesis at the level of fully solar-irradiated clusters during the six-week period of restriction of UV-radiance.

Light is essential for anthocyanin synthesis in petunia (*Petunia hybrida L.*) flowers with the active spectrum including most of the visible range, but not UV.[12] Blocking UV-B from apple flowers inhibited anthocyanin accumulation but did not completely inhibit anthocyanin synthesis.[7] Neither UV-B nor UV-C had an effect on anthocyanins of table grapes during post-harvest storage.[4]

R. Gallop and co-workers suggested the possible role of UV receptors in induction of gene expression of leucoanthocyanidin dioxygenase (LDOX), the enzyme that catalyzes the conversion of leucoanthocyanidins to anthocyanidins.[9] Their supposition was based on stimulation by white light and calcium of the expression of the LDOX gene in cell suspensions of red-fruited *V. vinifera* cultivars.

Of seven genes involved in anthocyanin biosynthesis in grapes that were examined, including LDOX, the gene responsible for encoding UDP-glucose:flavonoid 3-*O*-glucosyltransferase (UFGT) was the only one not detected in flowers and berry skins up to four weeks post-flowering.[2]

Expression of these genes then declined to veraison and then increased during grape berry ripening.[2,10] UFGT expression was detected only after veraison. Our study was based on end-product concentration rather than gene expression. Concentrations of monomeric anthocyanins were not affected by blocking greater than 95% of UV from bunch closure through harvest.

Roubelakis-Angelakis and Kliewer reported that the rate of anthocyanin accumulation and final anthocyanin concentration in the epidermal layer of excised Cardinal berries was greater at 35°C than at either 14° or 22°C.[24] In the present study, the number of hours above 35°C was associated with a net loss of TSMA. However, the number of hours above 30°C was positively related to TSMA concentrations.

Apparently, excessively high temperatures were detrimental to anthocyanin accumulation in the skins, but some degree of heat was needed for synthesis. The critical temperature for net anthocyanin accumulation in Merlot berry skins may lie between 30° and 35°C.

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More information is needed on critical temperature range(s) *in vivo* for anthocyanin biosynthesis and degradation in grape berry skins, recognizing that it may vary with cultivar. Once fundamental mechanisms are understood, practical methods for balancing cluster temperature with degree of sunlight exposure can be developed.

Conclusions

Excessive absolute fruit temperatures, rather than the difference between fruit temperatures and ambient temperatures, reduced anthocyanin concentrations in sun-exposed grape berries.

East- and west-exposed clusters received the same total exposure to solar radiation on cloudless days and were heated to the same degree above ambient temperature at the time of maximum sun exposure.

The highest absolute fruit temperatures occurred in west-exposed fruit because ambient temperature typically increases throughout the day.

In warm to hot viticultural regions, exposure of grapes to full sunlight on west- and south-facing canopies should be avoided unless some method is used for reducing fruit temperature.

Complete fruit shading is not recommended because some sunlight is needed for maximum anthocyanin synthesis and for balancing the composition of other fruit components.

Partial shade might be provided in vertical shoot positioned canopies by incomplete positioning of shoots on west- and south-facing canopies.

Leaf stripping should be minimized unless there are multiple layers of leaves. ■

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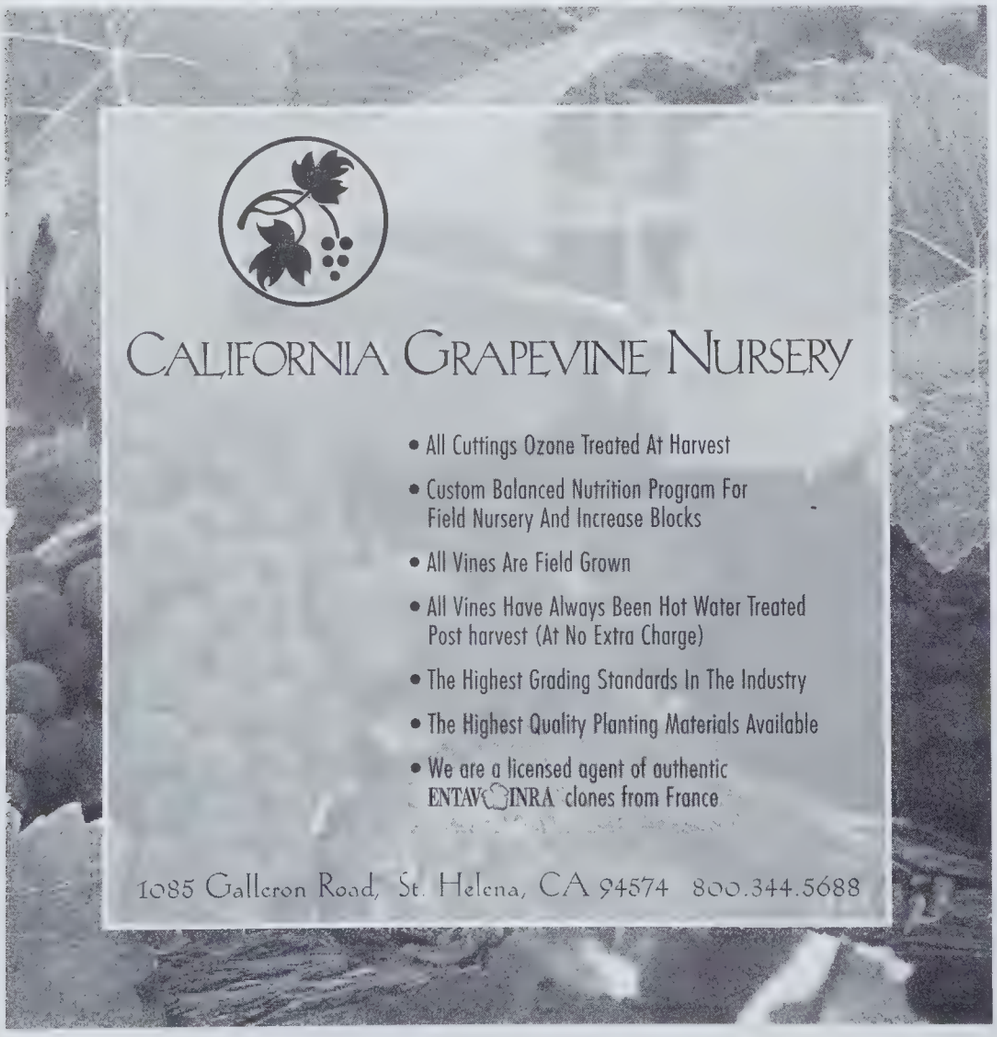
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Acknowledgments: The authors would like to thank the Washington Wine Advisory Committee for partial support of this study.

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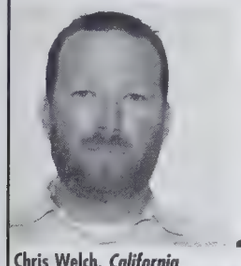
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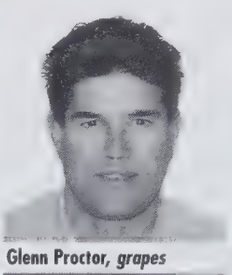
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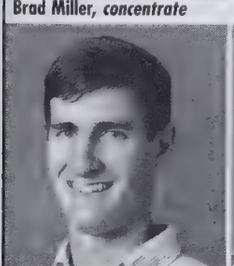
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VARIETAL REVIEW

SANTA YNEZ VALLEY

Cabernet Sauvignon cultivates a foothold

BY Eleanor & Ray Heald
Contributing Editors

First, white wines — Chardonnay and Riesling — then, the standout success of Pinot Noir brought recognition to the wines of California's Santa Ynez Valley. Now, Bordeaux varieties, particularly Cabernet Sauvignon, are growing well in some microclimates within the region.

Though their flavor profile is similar to North Coast Cabernet Sauvignon, Santa Ynez Valley (SYV) Cabernet Sauvignons have a different style than North Coast Cabernet Sauvignons, grown in Napa and Sonoma counties. SYV Cabernet Sauvignons have no inky-black color, no powerful structure, and no in-your-face, super-ripe dark fruit, or high tannin profiles. SYV's fruit-forward Cabernets are gentler, more feminine, and elegant.

However, Bryan Babcock (Babcock Vineyards) takes exception to this profile. "As a group," he notes, "if SYV Cabernet Sauvignons are not inky and muscular, that's exactly where they are headed. These Cabernets are in their infancy. If I did not think that we were going to make big wines, I would not be making them."

Most important, the best SYV Cabernets are no longer green, vegetal, and stemmy as they were only five years ago. These quite delicious Cabernets now offer an option in wine drinking — the very thing consumers want.

The Santa Ynez Valley American Viticultural Area (AVA) is centrally located in Santa Barbara County, off Highway 101, about a 2.5-hour drive north of Los Angeles. The western border of the SYV is the Pacific Ocean, and the Los Padres National Forest flanks the east. The Santa Ynez Mountains are situated to the south and the Santa Maria Valley AVA to the north.

Santa Ynez Valley is ranked as cool Region II, with both fog and offshore breezes. Yet within the broader AVA boundaries, there are sub-areas — such as Happy Canyon, Ballard Canyon, and even the northerly Foxen Canyon — where Bordeaux varieties ripen well in areas best classified as warm Region II or Region III.

Although warmer overall than the Bordeaux region of France, SYV behaves like a cool region — the very reason it's different.

Appropriate microclimates

Babcock credits the shallow and gravely soils of the hillside Westerly Vineyard in Happy Canyon, with its mitigated vigor, as a pioneer in the "new era" of SYV Bordeaux varieties.

"Cabernet Franc was encouraging at the beginning," Babcock says, "but now we realize that it is extremely susceptible to viruses and other viticultural problems. Vineyards that were making great Cabernet Franc five years ago have not made wines as good recently. With the onset of the greatness of Cabernet Sauvignon, this is where SYV producers are turning heads."

Babcock believes that Happy Canyon (situated west of Lake Cachuma and about five miles east of Highway 154) has the proper climate and soils for all Bordeaux varieties. "We've known for some time," he continues, "that from the standpoint of temperature, vineyards along

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Firestone Vineyard
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Bill Wathen, Partner/Winemaker
Foxen Vineyard
Santa Maria, CA

Sashi Moorman, Winemaker
Stolpman Vineyards
Los Olivos, CA

Highway 154 can ripen all Bordeaux varieties. Brander Winery has ripened them, and Gainey Vineyards has had major success with Merlot.

"Effectively, east of the Alamo Pintado transverse ridge line, which is the eastern edge of Ballard Canyon as it drops into the formal SYV, there are a sufficient number of degree days to ripen Cabernet Sauvignon."

In fact, Beckmen Vineyards is ripening Cabernet Sauvignon successfully in Ballard Canyon.

"The Ballard Canyon Road area, where Beckmen and Stolpman Vineyards are located," reports viticulturist Jeff Newton (Coastal Vineyard Care Associates), who manages vineyards for both wineries, "accumulates about 2,900 degree days. In Happy Canyon, where Westerly and Vogelzang Vineyards are located, there are 3,100 degree days accumulated. Cabernet Sauvignon has a hard time ripening without herbal flavors west of Ballard Canyon.

"Cabernet Sauvignon is suited to growing roughly between Ballard Canyon Road and Happy Canyon Road."

Kevin Willenborg (Firestone Vineyard) reviewed SYV degree days recorded at the California Irrigation Management Information System (CIMIS) station at the SYV airport between February 20 and October 31 from 1989 through 2002. He then made a degree-day comparison with the CIMIS station data from the Oakville sub-AVA in Napa Valley. This data shows remarkable similarity in degree days (about 3,400) between the two regions.

From data collected by Willenborg over the last several years at Firestone Vineyard in the northern reaches of SYV, there are, on average, 100 to 150 more degree days than the CIMIS data at the SYV airport shows. (See Figure I)

"Happy Canyon," Willenborg argues, "is a warm area and nobody disputes that, but there are other locations in SYV (such as the Firestone Vineyard) that can ripen Cabernet Sauvignon."

Sashi Moorman (Stolpman Vineyards) contends that "degree-day comparisons are a sticky wicket because they are a blanket people use to say 'we're comparable to another place.' But every SYV winemaker will state that our Cabernet Sauvignon does not taste anything like Napa Valley Cabernet Sauvignon.

"That's because in May and June, it's very foggy in SYV, and that's seemingly awful weather for growing Bordeaux varieties. In Oakville in May and June, daytime temperature highs (in degrees Fahrenheit) are in the 80s and in SYV are in the 60s. After veraison, grape flavors are distinctly different for Bordeaux varieties in Napa Valley than they are in SYV, where ripening happens later."

Newton adds that in Napa Valley at the beginning of veraison, Cabernet Sauvignon berries are starting to taste ripe. In SYV at the beginning of veraison, Cabernet tastes green. Clearly, there's something different about how the fruit ripens.

Willenborg suggests solar radiation, and the resulting warming of grape

Santa Ynez Valley American Viticultural Area

berries, is the key factor for respiring pyrazines and reducing green flavors. SYV has a longer, although slightly more moderate growing season from bud break in early to mid-March (if not late February) to harvest in mid- to late October.

Transformation

Babcock cites canopy management and better site selection to less fertile soils as major factors transforming SYV's former vegetal wines to ones with interesting aromatics and flavors. SYV vineyards for Bordeaux varieties are locating inland, away from the Pacific Ocean, and moving from the sandier western soil profiles (more suited to Pinot Noir) to denser and shallower, rocky clay soils.

Yet in 1975, Brander did not plant Cabernet Sauvignon on shallow soil. "Traditionally in the Bordeaux model, great Cabernet Sauvignon soil is gravel," Fred Brander (Brander Winery) explains. "In addition to draining well, the advantage of gravel is that the ground heats up quickly and retains heat."

Additionally, Brander vines, like Firestone's, are own-rooted. "There's no evidence that this makes a difference, however," Brander indicates. "It's all about the soil." Even though crop levels from the earliest years have always been low (not greater than 2.5 tons/acre), in the early 1990s, Brander retrofitted the vines to Vertical Shoot Position (VSP) to yield improved fruit quality.

"I'm making better Cabernet Sauvignon today," Brander says, "because we're picking riper at 25° Brix-plus. In the early years, we never picked above 24° or 24.6° Brix."

To achieve maximum flavor profiles, all winemakers interviewed pick Cabernet Sauvignon between 25° and 26° Brix.

"Currently, hang time is a sexy term," Moorman maintains. "If the winemakers in this discussion could make beautiful, complex, dense wines with lower alcohol, we would. If we could get the requisite flavors and not have 15% alcohol, we would.

"It's not because we're into hang time, we're all waiting for the grapes to achieve physiological ripeness. If we didn't have to wait, none of us would be saying 'Whoa, but we've not had four weeks of hang time between the end of veraison and harvest.'"

Babcock adds, "If we could make rich beautiful Cabernets with 10% alcohol instead of 15%, people could drink more wine and we'd sell more! What we do as winemakers is make the best product we can.

"Let's face it. It is the big, inky black, alcoholic trophy Cabernets that get 96 or 97 points from the critics who rate by numbers — these wines drive the market right now. Wine is a very style-driven product, and each winery develops its customers based on its interpretation of winegrowing and winemarketing."

Pyrazines and other factors

Willenborg, who worked 14 years in Napa Valley, reports that flavor profiles change in a matter of two to three days there. He notes that, as harvest in SYV gets closer, it frequently takes a week for the same type of development near harvest in SYV.

"To a certain extent," Steve Beckmen (Beckmen Vineyards) says, "this can be regulated by irrigation, but it still comes down to temperature differences. SYV is warm early, then it is cool, and then typically very warm late in the season. In years when temperatures in September and October reach above 90°F, we've been most successful with Cabernet Sauvignon. At the beginning of the growing season, temperature is less important."

Willenborg believes that late season heat is a key factor in respiring pyrazines (particularly methoxypyrazine), which contribute to vegetative qualities. "Since SYV has a more southerly latitude," he notes, "the longer the grapes hang on the vine, the better the flavors. In more northerly latitudes, the chance of having late season heat spells diminishes.

"Due to heat in the period from veraison to time of harvest, methoxypyrazine respires in tandem with malic acid. Having heat in that period influences respiration. What held SYV back with Cabernet Sauvignon in the early years was high concentration of pyrazines. Picking at lower sugars from shaded canopies did not allow pyrazine respiration or berry tones to develop."

Beckmen reports that acid respiration in SYV is not problematic. If anything, winemakers and vineyard managers are waiting for acid to reduce because malic acid is always high.

In addition to lower pyrazine content at higher sugar levels, Newton suggests enhanced aroma and flavor compound development. As vegetal components decrease, berry and cherry characteristics increase.

When asked to identify the flavor differences in the finished wine that make SYV Cabernet Sauvignon different from North Coast Cabernets, Fred Brander disputes that there are character differences between Napa Valley Cabernets and those from SYV. He maintains that he's conducted blind tastings of wines from both regions with winemakers. They were unable to distinguish the SYV Cabernets.

"We've been comparing SYV to other regions," Moorman notes. "When doing this, it really depends on what's being compared. If it's some average wine from North Coast and average from SYV, there may be more or less of a difference. Yet, I know from my experience that when I taste the best examples of Cabernet Sauvignon from Napa Valley and the best examples from SYV, there's a big difference."

Distinguishing factors

Beckmen is growing several clones of Cabernet Sauvignon and suggests that Clone 8 is the least tannic. That's another perspective — different clones have different tannin profiles. "All the Cabernets that we've been most successful selling have a softer quality," Beckmen notes. "At harvest, seeds and stalks are very mature. The wines are fruit forward yet elegant."

In Happy Canyon, Bordeaux varieties enjoy a slightly warmer viticultural area with the added advantage of a new area where state-of-the-art viticultural techniques have been employed in the latest plantings. Among these are high density plantings of new clones and rootstocks. When the terrain allows, spacing is six feet between the rows and three feet between vines (2,420 vines/acre), planted in a north-south orientation.

Row direction for newer plantings protects vines from peak heat earlier in the day than the North Coast. The most intense light and heat in SYV is from 11 AM to noon, followed by a cooling breeze in the afternoon, which knocks the top off daily heat spikes.

Following French thought about close spacing (meter x meter), Brander experimented with 4 feet x 4 feet and discovered that the extreme devigorization of such plantings jeopardized vine health.

Irrigation

In SYV, it does not rain between April and September. Consequently, growers are rethinking approaches to irrigation to keep vines in balance.

In general, a 50% deficit irrigation program has been targeted. Pressure

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baums indicate when to begin irrigation. Once started, weather stations throughout the valley calculate evapo-transpiration, and this data aids calculation of the number of gallons of water/vine/week that is equivalent to 50% deficit irrigation. In addition, visual assessment of the vines is made weekly.

Based on such information, irrigation may continue to within two weeks before harvest, in amounts to keep the leaves active and producing carbohydrates.

Participants formerly believed that the best irrigation practice was frequent small volumes of water, even though they knew this was not the best method to encourage vines to sink a deep tap root. Since then, SYV growers have adopted compromises. To saturate the soil early in spring, vines are given 20 to 24 gal of water/vine over a two-day period. At veraison and post-harvest, the practice is repeated.

"We believe," Beckmen says, "that greater volumes of water drive the tap root better. We view this as fake rainfalls. Continuous watering at the top creates lazy roots."

When temperatures near 100°F, vines are irrigated at 2 gal/vine/day through a drip system until the heat spell breaks. This also offers a degree of protection against sunburn.

Newton reports that sulfur dusting after set has been eliminated. When sulfur dust fumes, it creates heat around the berry and aggravates sunburn.

Disease pressures

Compared to most varieties, Cabernet Sauvignon and other Bordeaux varieties are fairly resistant to botrytis and powdery mildew. This is well-tested in this region with prime disease-promoting morning fog, 100% humidity, and temperature in the 50s.

Since most of the newer plantings are in the eastern sectors of SYV (away from the Pacific Ocean), disease pressures are further reduced. Typically, when the sun evaporates the fog, breezes in the range of 3 to 9 miles/ hour begin blowing and vines dry out.

"Of the Bordeaux varieties," Babcock adds, "Cabernet Franc is the most sensitive to disease pressures. If a vine is virused and under some pressure, whether it's heat or dehydration, Cabernet Franc collapses most easily, followed by Merlot, then Cabernet Sauvignon."

Fermentation

Winemakers say that except for a few tweaks relating to style, they make Cabernet Sauvignon by traditional methods.

Brander does a 5-day pre-fermentation maceration at 45°F. When the sugar reduces 1° to 2° Brix, pump-overs begin.

Depending on the vintage and the fact that its fermentors are without temperature controls and located outdoors, Bill Wathen (Foxen Vineyard) may do none or as many as five days of cold soak.

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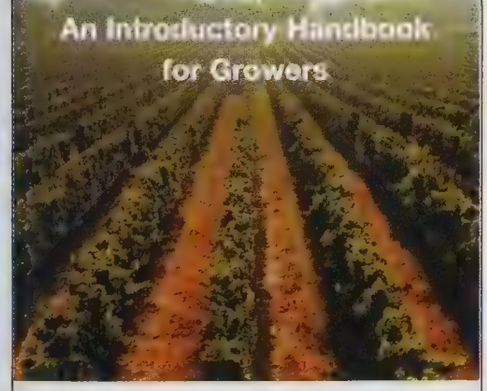

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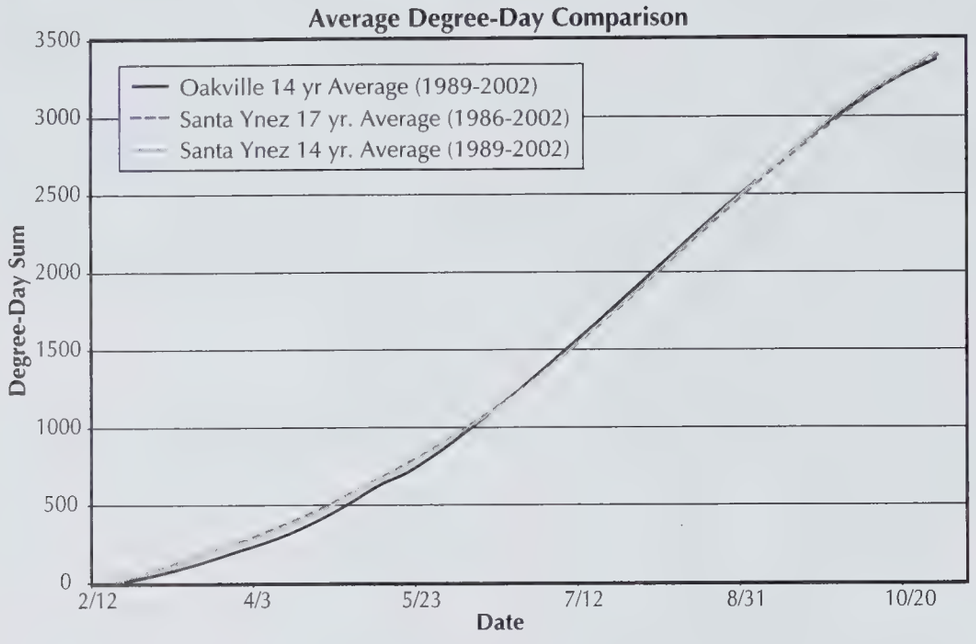

Figure 1: Long-term degree-day comparison of data collected at the California Irrigation Management Information System (CIMIS).

Moorman routinely conducts a 5 to 6-day cold soak at 50°F.

Among data provided by the winemakers, excluding yeast choices (which winemakers believe is a matter of what gets the job done best for them), total skin contact time ranges from 7 to 45 days.

Babcock notes, however, that the "numbers" in this discussion represent data for the 2001 vintage. Each year is different, he explains. "In 2001, it was 8 days for me."

"We're working with really good fruit. We crush it, add CSM yeast culture, and the next day it begins fermenting. The wines are very dark after 4 to 5 days. We could go longer than 7 or 8 days, but then we begin riding a potential wave of tannin, asking how long do we let it go?"

Beckmen, who reports 8 days total skin contact, emphasizes "for this wine. But every fermentor needs to be monitored and every year it's different. We don't have a set number of

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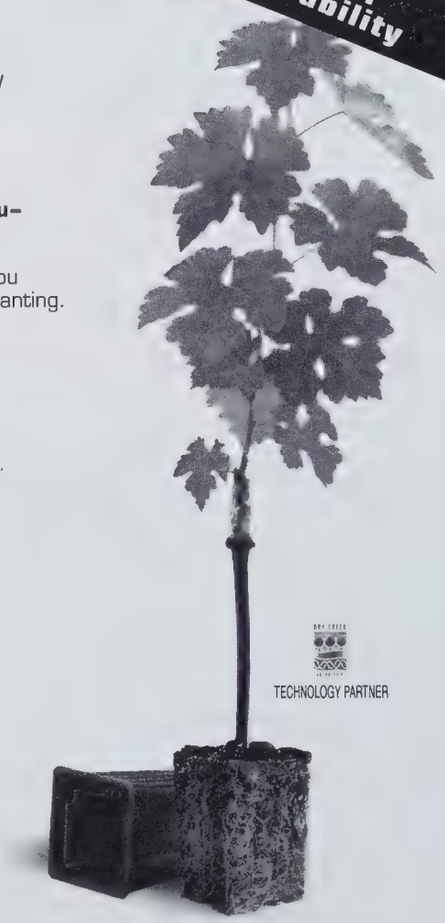

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days or a window. Basically, our method is to warm up the fermentor quickly and get the wine through fermentation. Our most successful wines are those that are not as tannic as North Coast Cabernets. So, we're very conscious of tannin, especially with Clone 15. Clone 337 is somewhat more moderate.

"We're very mindful of the herbal element that SYV Cabernets can have, so we drain the tanks and press the wine when there's still a lot of sweetness to the fruit. We used to do 28 to 35 days of skin contact for Cabernet, and the wine had a tendency to dry out and develop herbal rather than fruit characters."

Wathen chooses longer skin contact, "In 2001, he says, "I found it necessary to retain the wine on the skins for 45 days. Early on, I did not like the tannin profile that Clones 337 and 341 gave the wine, so I waited and tasted. When the tannin profile reduced, I pressed the wine."

Babcock notes that tannin management is a very important winemaking consideration for SYV wines. In this regard, all winemakers report that they have backed off punchdowns or pumpovers. In general, good fruit was being overpowered by too much astringency. With great fruit to work with, the wine becomes saturated with flavor and soft tannins without a lot of work to the cap.

Blending varieties, 2001 vintage

Because Willenborg believes that Cabernet Franc has overall age-worthy tannins, he blended 11% into the wine, which also added a textural mid-palate component.

"We rarely like a 100% Cabernet Sauvignon from our vineyards," Beckmen reports. "We found that 3% Cabernet Franc and 2% Merlot tweaked the fruit profile to our liking."

The Stolpman wine is purely a stylistic blend of one-half Cabernet Sauvignon, one-third Merlot and 17% Sangiovese.

Babcock added 11% Merlot to the 2001 wine because it made the wine taste better.

Wathen's preference kept the Foxen wine 100% varietal.

Brander usually adds about 10% Merlot. In 2001, he bumped it to 15%. He never considers adding Cabernet Franc because of uneven ripening and the weedy character it adds to Cabernet Sauvignon.

Last drop

Interviewed winemakers consider Chuck Carlson of Curtis Winery (Los Olivos, CA) a Santa Ynez Valley grape historian. "In the late 1970s and early 1980s," Carlson recalls, "growers in Santa Ynez Valley were infatuated with Cabernet Sauvignon, but their interest took a hiatus until three years ago.

"Now with new clonal material and new planting sites, Santa Ynez Valley is experiencing a Cabernet

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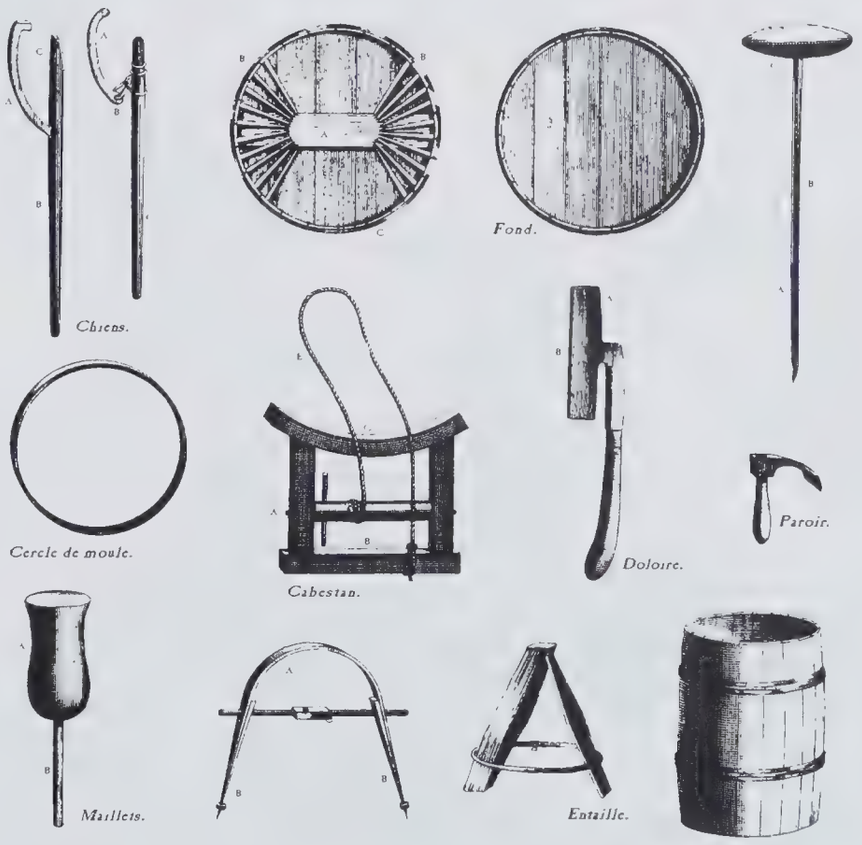

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Sauvignon renaissance. This discussion/tasting is unique because it includes two older vineyards (Firestone and Brander), which were planted over 25 years ago with older clonal material. However, both have taken advantage of newer viticultural techniques and improved canopy management.

"From 1982 to the mid-1990s, Cabernet Sauvignon was not the focus of attention. Pinot Noir, Chardonnay, and Syrah were leading the region. Cabernet Sauvignon has come full circle in Santa Ynez Valley."

After completing the blind tasting, Bill Wathen expressed the full scope of that circle best. "The heady fruit in all these wines speaks volumes about why we're discussing them." ■

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TASTING NOTES

Santa Ynez Valley Cabernet Sauvignon

2001 Babcock Vogelzang Vineyard Cabernet Sauvignon

(89% Cabernet Sauvignon and 11% Merlot)

Color/Aroma: Ruby with youthful edges. Ripe berry, cherry and cedar spice.

Flavors: Red fruits, plum cake, cherry, tobacco, and spicy oak shading

Balance/Finish: Tight, linear, complex with good structure and round tannins.

2001 Beckmen Vineyards Purisma Mountain Vineyard Cabernet Sauvignon

(95% Cabernet Sauvignon, 3% Cabernet Franc, and 2% Merlot)

Color/Aroma: Dark ruby red. Heady, red fruit, currants, cassis, boysenberry, nutmeg, and soy.

Flavors: Red and black berries, plum, blueberry, and chocolate.

Balance/Finish: Good balance; strong and assertive but smooth finish with great grip.

2001 Brander Estate Bottled Reserve Cabernet Sauvignon

(85% Cabernet Sauvignon and 15% Merlot)

Color/Aroma: Medium ruby red. Dark bing cherry, good varietal character.

Flavors: Good oak integration, berry-cherry, plums, blueberry, boysenberry, tobacco, and chocolate.

Balance/Finish: Fruity, plump, and persistent finish with fine tannins and nice balance.

2001 Firestone Estate Cabernet Sauvignon

(88% Cabernet Sauvignon, 11% Cabernet Franc, and 1% Petit Verdot)

Color/Aroma: Medium ruby red. Pure berry fruit, boysenberry, and thyme.

Flavors: Dark berries, slightly herbal, coffee, cassis, oak, and vanilla.

Balance/Finish: Medium-light bodied with smooth fine tannins.

2001 Foxen Vogelzang Vineyard Cabernet Sauvignon

(100% Cabernet Sauvignon)

Color/Aroma: Dark ruby red with youthful edges. Plum, blueberry and spicy oak.

Flavors: Red and black fruits, sweet ripe berry, dark cherry, and chocolate.

Balance/Finish: Tightly wound strong finish with smooth, ample tannins. Ageable.

2001 Stolpman "Angeli"

(50% Cabernet Sauvignon, 33% Merlot, and 17% Sangiovese)

Color/Aroma: Medium ruby red. Red cherries, ripe berry, and heavy toast.

Flavors: Red fruits, currants, boysenberry, red stone fruits, spicy and oak-driven.

Balance/Finish: Medium body, smooth with fine tannins and good length.

PWV thanks Babcock Vineyards for hosting the discussion/tasting.

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SANTA YNEZ VALLEY WINES

Pushing the Cabernet envelope

BY Mary Evely

Generally, good young Cabernet Sauvignons and Bordeaux-style blends present themselves with the disciplined backbone of a military man. They command our attention, make fatty and powerfully flavored foods fall in line, and they brook no infraction by any display of sweetness. No, sir!

What a welcome it is to discover Cabernet Sauvignons from the Santa Ynez Valley (SYV). Their lush fruit and generous richness are immediately friendly, and the tannins follow up with the palate equivalent of an iron fist in a velvet glove. How far can we push the envelope on these wines? Well, not too far. They are Cabernet Sauvignons, after all.

Following the fruit

The fruitiness of these SYV wines suggests that the range of foods suitable for a successful pairing might be broader than for Cabernet Sauvignons in general. With most Cabs, if any hint of sweetness appears in accompanying food, the wines turn sour and/or bitter. Fruit, beyond a shot of cassis in a reduction sauce, is usually to be avoided.

However, the panoply of berry aromas and flavors in Santa Ynez Cabernets tempted me to try some late season blackberries. Tasted straight off the bush, the high acid in the fruit flattens the wines, but simmering the berries in a combination of the wine and some brown stock disperses the fruit sugars and acids, producing an excellent basting medium and sauce base for roasted duck. Pomegranates, although less acidic than berries, do not work without a similar modification through cooking.

Even though we know that tomatoes are a fruit, we still tend to view them as a vegetable — that is until we pair them with wine. Tomatoes are high in acid and, when vine-ripened, even higher in sugar. They destroy most red wines, just as other fruits do. A fresh tomato risotto throws the Santa Ynez Cabernet Sauvignons out of balance, but with the addition of a bridge of bitter oil-cured olives and fat/salty Parmesan cheese, the wines show admirably.

The vegetable bin

The forward fruit in the wines does allow the cook to go beyond the usual safety of eggplant, red chard, summer squash, and bitter greens when choosing vegetables. First to come to mind in the category of vegetables with some sweetness are red beets. Though their earthy flavors suggest a good pairing with red wines, their high sugar content most often overwhelms the fruit in the wine.

Santa Ynez Cabernets are up to the challenge, making a great combination with beets in a shallot-sherry vinaigrette. *(For successful pairing of wine with vinaigrette dressings, use a 4:1 ratio of oil to vinegar and avoid traditional red-wine vinegars, which are overly aggressive.)*

Red bell peppers do not work, either in their raw form or grilled; neither does grilled fennel. Carrots and corn are also too sweet to work as stand-alone vegetables, but do fine as part of the flavor base of a stew or sauce. Even in the form of polenta, corn is still too sweet for Cabernet.

Grains and legumes

The earthiness and depth of flavor in wild rice, geen and black lentils, and black beans are always good matches for those aspects in Cabernet. With the fruit and rich, broad palate of these Cabernets, we can also include almost all dried beans, plus bulghur and quinoa. Their gentle sweetness is no problem at all. (Flageolets should still be avoided, as their green, vegetal character survives the drying process and is unpleasant with any red wine.)

Matching the richness

Although Cabernet can often cut through heavy, rich dishes and balance the palate impact, just as often a Cabernet is left tasting rigid, unyielding, and unpleasantly bitter. The richness of this group of Cabernets suggests a likely ability to balance, and that is the case.

The rich aspects of both the food and the wine are in perfect balance when a traditional cassoulet is served with an SYV Cabernet. Other memorable combinations in the rich-to-rich department are duck confit and braised pork cheeks.

Seafood surprises

These days, pairing grilled salmon or rare ahi tuna with Cabernet is nothing new. The fruity richness of the Santa Ynez Valley wines tempts a foray further afield (a-sea?) with interesting results; the subtle sweet richness of lobster, shrimp, and sea scallops works surprisingly well. With the addition of some bridge ingredients, it is an inspired combination. One delicious example is a lobster sausage with fennel seed served with beluga lentil salad.

Caution with cheese

With big, lush Cabernets on the table, it is easy to slide back into the mindset of choosing big, fat cheeses. Put the Stilton back to wait for the Port; it doesn't work here — neither do

those wonderfully stinky, washed-rind, aged goat cheeses nor any of the double or triple-cream cheeses. With these, the wines become unbalanced — overly sweet and dull.

Cheeses with some sweetness, such as Dolcelatte Gorgonzola, clash wildly with these wines. Hard cheeses, such as dry jack, Parmesan, aged provolone and tome, are the best choices here.

Preparation methods

Grilling, roasting, and braising are ideal for Cabernet Sauvignon. With the Santa Ynez Valley wines, you can also add slow-roasting, as the fruit in the wines easily handles the added sweetness from the caramelizing process.

Marinating or brining meats and poultry brings additional richness to preparations, matching the richness in these Cabernets.

Rich stews are outstanding with Santa Ynez Valley Cabernets.

Food affinities and conflicts

(Foods with an asterisk are recommended for Santa Ynez Valley Cabernets only.)

Affinities

Seafood: salmon, ahi, shrimp*, lobster*, sea scallops*

Meat and poultry: beef, lamb, pork, duck, goose, foie gras, sausage

Herbs and spices: back pepper, garlic, juniper, lavender, mustard, rosemary, savory, star anise, thyme, fennel seed*

Cheeses: dry jack, Parmesan, aged provolone, tome

Vegetables and fruits: eggplant, radicchio, endive, red lettuces, red chard, summer squash, morels, portobellos, black chanterelles, oil-cured olives, red beets*, celery root*, plus berries* and pomegranates* when modified by cooking

Grains, legumes, etc: lentils, wild rice, black beans, white beans*, red and pinto beans*, bulghur*, quinoa*

Conflicts

Seafood: oysters, smoked fish, sole, whitefish

Meat and poultry: veal, pheasant

Herbs and spices: cilantro, cumin, dill, chili peppers, curry, capers

Cheeses: Swiss cheeses, double and triple cream cheeses, blue cheeses

Vegetables and fruits: asparagus, green beans, artichokes, bell peppers, snow peas, fennel, corn/polenta, most fruit, all dried fruit

TASTING NOTES

Wines tasted specifically for this article were:

2001 Babcock Vogelzang Vineyard

2001 Beckmen Vineyards Purisma Vineyard

2001 Brander Estate Bottled Reserve

2001 Firestone Estate

2001 Foxen Vogelzang Vineyard

The Stolpman 2001 Angeli was also tasted. However, with a composition of 50% Cabernet Sauvignon, 33% Merlot, and 17% Sangiovese, it did not fit the profile of the other wines when tasted alone, and it did not show well with the rich and slightly sweet foods indicated by asterisks above. ■

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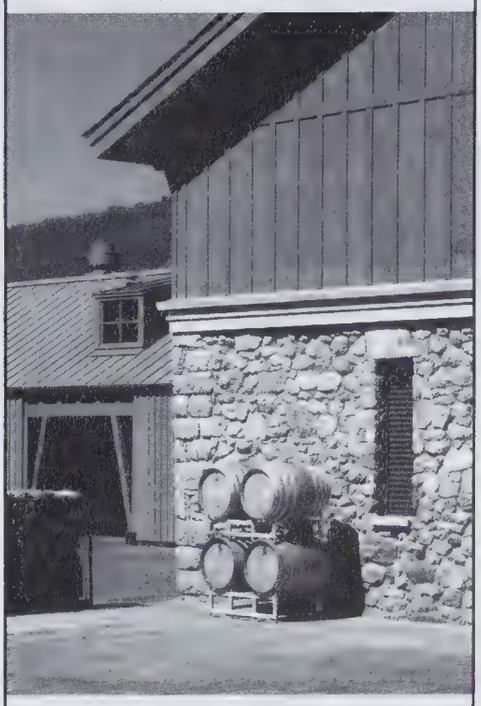

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SUSTAINABLE BUSINESS

Looking to the sun for renewable energy

BY Tina Vierra

Wineries in the U.S. (especially in California), have been installing solar energy systems at an ever-increasing rate in recent years.

While the energy efficiency and environmental benefits of solar energy have long been known, the initial cash outlay for a solar system has deterred many potential customers. But solar energy advocates and installation companies have capitalized on current state and federal incentives to make solar energy more attractive than ever.

Mount Eden Vineyards

Mount Eden Vineyards (Saratoga, CA) installed a 20 kilowatt (KW) capacity photovoltaic (PV) solar system in October 2003. (For comparison purposes, the average size for a home solar system is 2.5 KW.) Working with Akeena Solar (Los Gatos, CA), the 14,000 case/year winery chose an $185,000 system.

Mount Eden's system was installed on a hillside near the assistant winemaker's home, and includes 136 panels of 185 watts each (known as "modules"), and nine "Sunny Boy" inverters. Inverters work to turn the energy current, generated as DC current through the solar modules, to AC current for use in the winery.

Some systems are installed with a single inverter with the same capacity as the entire system. Others employ multiple inverters, whose capacity adds up to the total system capacity.

At Mount Eden, the winery and solar company agreed on multiple inverters. "Although slightly more expensive, we took this approach because with multiple inverters, failure of one will not affect the others, and they operate at a slightly higher efficiency over a single inverter," says Barry Cinnamon of Akeena Solar.

At its peak (during long, sunny summer days), the Mount Eden system will generate 20 KW of power. Annual energy output is a factor of sunlight hours, sun intensity, orientation of the panels, equipment output, and efficiency losses during power transmission or periods of down equipment.

Akeena, like other solar system installers in this report, works closely with client wineries to assess not only the amount of energy needed to serve the winery, but the confusing maze of energy rebates, tax credits, and other financial incentives offered by local and state energy programs.

"We developed a detailed economic analysis of the system for Mount Eden," reports Cinnamon. "Mount Eden is on Pacific Gas & Electric's (PG&E) A6 rate, which is a small, commercial Time of Use (TOU) rate. TOU rates are terrific for PV systems because they generate additional energy credits during summer afternoons — exactly when PV systems create their greatest output. Mount Eden has an annual electric bill of about $7,000. We expect that their bill will drop to $55 — virtually zero."

Incentives for commercial PV systems are significant. The California Energy Commission (CEC) offers up to $4 per kilowatt-hour (KWH) in rebates for a commercial business that applied before June 2003; a $3.80 per KWH rebate for businesses that filed before December 31, 2003; and a $3.60 per KWH rebate after January 1, 2004. As its funds run out, the CEC reduces the rebate by $.20 per KWH every six months.

Photos provided by Ridge Winery

Ridge Lytton Springs Winery expects to generate 80,000 kwh/year using this 66kw solar system, installed in September 2003.

For 30 KW and smaller systems, the California Public Utilities Commission offers a rebate of up to half the net purchase cost of the system. The federal government offers an investment tax credit of 10% on the remaining cost of the system installation after the CEC rebate. The state of California offers its own tax credit (15% until the end of 2003 and 7.5% thereafter).

There is a depreciation credit on a PV system from state and federal governments. Some PV systems are set up to feed excess power *back* to their energy company, making the winery a power producer that is paid for the power it generates.

With Akeena helping on all of the state and federal paperwork, Mount Eden expects the $185,000 system to cost only $90,000 in its first year, and to pay for itself within five to seven years of operation.

Vino Noceto Winery

Vino Noceto Winery (Plymouth, CA) installed a 10 KW system in the spring of 2002. The system consists of four 2.5-KW panels and four Sunny Boy inverters. An attractive aspect of smaller multiple inverters like the Sunny Boy is that they are mass-produced, making them quicker and easier to replace or repair if they go down.

The 200-ton capacity winery is at 1,500-foot elevation in the Sierra Nevada foothills, and the panels were installed facing southwest for good sun exposure. They are mounted on a sloped (15%) roof. With only four relatively lightweight panels, the winery did not have to reinforce the roof before installation.

The system cost was $110,000, but the winery received an immediate state rebate of 40% of the installation costs. Owner Jim Gullett expects payback in six to seven years, and may install up to 50% more solar capacity in the future.

"Before we installed solar," he reports, "during harvest, we paid an average energy bill of over $1,000 per month. Since putting in solar, our bills during bottling average about $100 to $300, and other months the bill swings down from $100 past zero to as low as –$50."

In a 12-month period from May 2002 to May 2003, the winery saved $9,000 on its PG&E utility bills, going from annual spending of $13,800 to just $4,800.

Sierra Vista Winery

Inspired by an open house at nearby Vino Noceto, John and Barbara MacCready of Sierra Vista Winery (Placerville, CA) installed a solar system in September 2003.

Table I

EXAMPLE: Commercial installation[1]

Total system size	**25 Kilowatts AC**
Total installed system cost	$200,000.00
California state rebate ($4.00/watt)	–$100,000.00
Federal 10% investment tax credit (businesses only)	–$ 10,000.00
Net installed system cost	$ 90,000.00
15% Tax credit (all in year 1 or spread over 7 years)	–$ 13,500.00
5-Year federal accelerated depreciation savings[2] (34% tax rate)	–$ 32,300.00
State depreciation savings[3] (6.5% tax rate)	$ 5,622.50
Final cost (in year 6 after final depreciation)	**$ 38,577.50**[4]

[1] For more information about renewable energy financing, contact the Renewable Energy Development Institute at (707) 459-1256 or mail@redinet.org.

[2] Calculated as follows: (total installed system cost – state rebate – ½ of the 10% federal investment tax credit) x federal income tax rate. Assumes "non-corporate" business taxpayer using Modified Accelerated Cost Recovery System (MACRS). Please note that "corporate" business taxpayers may not use MACRS for California depreciation calculations and should instead use a 12-year recovery period.

[3] Calculated as follows: (total installed system cost – state rebate – 15% tax credit) x state income tax rate.

[4] Final costs will vary depending upon each taxpayer's individual situation and should be determined with the assistance of a qualified tax professional.

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Table II
Incentives in California slashed

	end of fiscal year 2003 before	after	end of fiscal year 2003 before	after
Total solar project size	12 KWH	12 KWH	36 KWH	36 KWH
Total installed cost	$99,000	$99,000	$224,000	$224,000
Total incentives including:				
CEC rebate				
State and Federal tax credit				
State and Federal accelerated depreciation	$71,226.17	$60, 437.23	$163, 219.38	$138,517.70
Net cost for businesses	$27,773.83	$38,562.77	$60,780.62	$85,482.30
Savings difference	**$10,788.94**		**$24,701.68**	

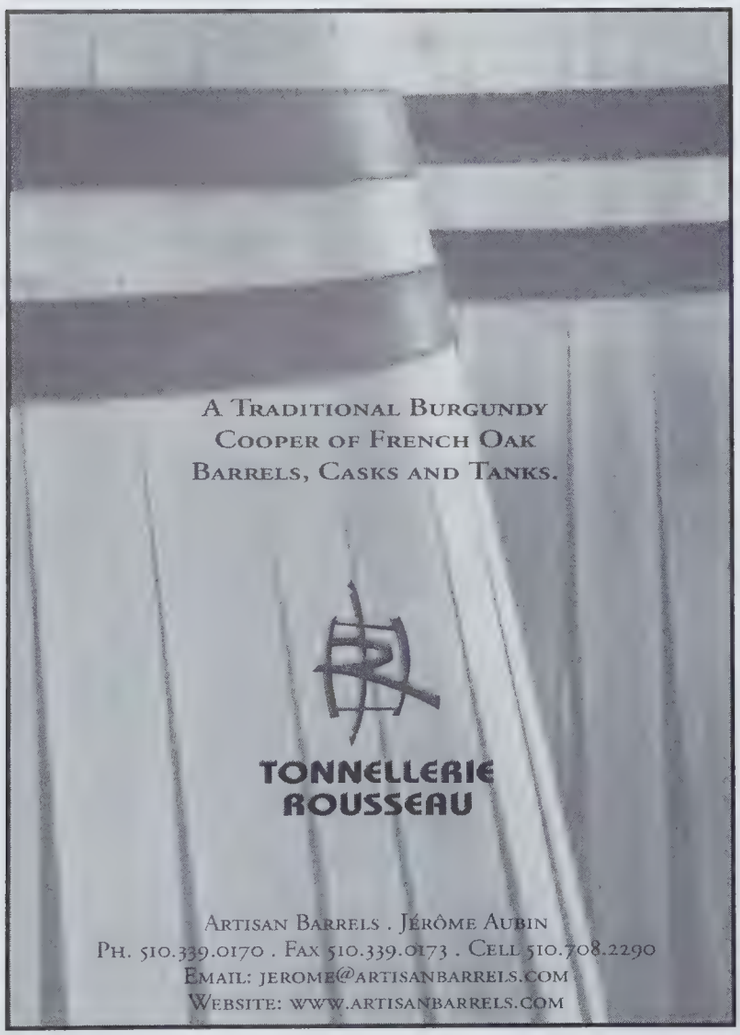
All of the above figures are examples only.
Consult your tax advisor to determine the actual amounts, definitions and if you qualify.
Chart compiled for *PWV* by Premier Power

"We saw the Vino Noceto installation and asked Premier Power (El Dorado Hills, CA) and another company to give us quotes. We were committed to the project if we could afford it," John MacCready says. "We also bought a new Europress to replace our old press, and those two projects are significant for a small winery with no deep pockets in a less-than-great economy."

The gross cost of Premier Power's system was $100,000. Rebates, tax credits, and depreciation reduced the actual out-of-pocket cost to less than 70% of the gross cost. The solar provider helped the MacCreadys with paperwork for the rebates and tax credits, which were provided in the initial quote. (See Table II for details.)

Sierra Vista's system is 14.4 KW, installed on the winery operations building at a slope of 1:12, with half of the roof facing southeast and the other half northwest. The panels are Sharp 185 modules as at Mount Eden, with Sunny Boy inverters, and they cover 1,500 square feet of the roof. Just the presence of the panels shading the roof of the building should reduce summer cooling costs by as much as 10%.

At an elevation in the Sierra Nevada mountains of 2,800 feet, the winery can expect few problems with fog or other sun occlusion. "We see fog at the winery once or twice a year, but see fog in the valleys around the winery quite often," reports MacCready.



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Accounting for factors such as fog is important in helping determine what type of solar modules to install. "There are different types of modules for different applications," explains Deborah Millhollin of Premier Power. "Certain modules are suitable for areas with fog; others are better for very warm temperatures, and others for cool temperatures."

The Sharp solar panels at Sierra Vista have a life expectancy of up to 30 years and are guaranteed for 25 years. Wineries should check warranties with their solar energy installers, since it is a contingency of some state and federal credit/rebate programs that the systems be under warranty and/or service contract for at least the first five years after installation.

Sierra Vista Winery bottled 8,659 cases of wine in 2002, and crushed 126.5 tons. The building is well-built and insulated, needing no reinforcement to install the solar panels.

Premier Power tied the Sierra Vista system into the electrical grid for "net-metering." Under the net metering system, once the winery's own energy needs are met, it can funnel energy back to its utility, PG&E, during peak efficiency times such as sunny summer days.

"The Interconnection agreement we provided means PG&E now considers the winery to be a power producer and not a consumer. Sierra Vista will pay a utility bill annually, paying only the difference between what it produces and what it uses," adds Millhollin.

Bokisch Ranches

Markus Bokisch is using solar energy to power vineyard irrigation in Clements, CA. A 7.5 KW system has three inverters, provided by Renewable Technologies, Inc. (RTI) of Sutter Creek, CA. The vineyard is on the net metering system with PG&E.

Installed on a shop roof at Bokisch's vineyard, the system sends about 50 KW per summer day to the power grid. At night, 35-horsepower pumps pull energy off the grid to water the vineyards.

"Right now, we're producing about 35% of the energy we need to power the irrigation for 60 acres, our shop, and a home," Bokisch reports. "We'll need a 22 KW system for 100% of the power we need in summer, 50% in winter. We will install more panels and hope to be up to 22 KW by spring 2004."

The modules are on a 22% incline, in an area with low dust, and they achieve about 78% average annual efficiency. To keep the panels efficient, simple maintenance with sprinklers to rinse dust and dirt is planned.

Bokisch hopes more farmers will get into solar. Indeed, he has seen enough interest from fellow growers that he finds himself guiding informal tours of his solar energy system and educating his peers.

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Bokisch Ranch produces 35% of the energy needed to irrigate 60 acres with a 7.5kw system on the shop roof (right).

Island, NY, with offices in California. CEO Ezra Green has been trying to get Long Island vintners interested in solar energy, but is hampered by New York's net metering program which does not allow power providers to "bank" energy savings they feed back to the grid for future use.

"We do a lot of farms in surrounding states, and are beginning to work with small wineries in California," he reports. "Small farms and businesses are the perfect candidates for solar use. The process for getting started is very simple. A grower need only collect 12 months of utility bills, then fax or mail them to us. We give a working proposal recommending system size, potential savings, and a list of components we'd supply. Then we visit the site and walk the owner through the process."

Clear Skies' specialty has been working with water companies like World Water in New Jersey, designing systems to power irrigation and water management. Flatbrook Farms in Montague, NJ, is an example. Clear Skies installed three systems (10, 8, and 4 KW for a total 22 KW system) at Flatbrook.

The solar panels are Sharp brand (Clear Skies uses mass-produced name brands for cost reduction and ease of

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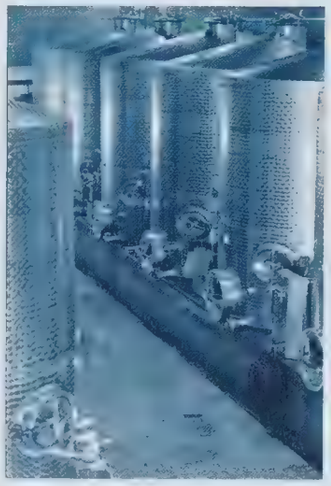

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Photo by Fred Lyon

SunPipes, in ceiling at energy-efficient Domaine Carneros, have diffusers that bring an average 1000 watts of beneficial daylight to the fermentor room.

repair or replacement), with Sunny Boy inverters, mounted with galvanized piping set in 12-inch pilings. Green describes the panels as "single crystal" panels, which have the highest ratings for efficiency of energy collection. Power flows through the inverters, converts to AC power, and then goes into the circuit breaker panel for Flatbrook's consumption.

Green and his team monitor new systems closely at first. "For the first three weeks, we monitor the system weekly. Then we come every two weeks for the next six weeks; then every couple of months for the next six months. There are very few problems with solar energy systems," he reports.

Solar energy systems require little to no maintenance, Green notes. Clear Skies systems use no moving parts.

Another Clear Skies customer, Rex Farr in Calverston, NY, is participating in a pilot program to bring renewable energy to farms currently dependent on fossil fuels. Farr's 30 acres of vines will get a new drip irrigation system powered by solar energy.

"By shutting down one diesel generator," Green states, "you are eliminating tons of pollutants from the air. If we change our energy-producing methods, the effect on the environment will be profound."

Seavey Vineyard & Winery

Seavey Vineyard (St. Helena, CA) had a 10 KW system installed by Renewable

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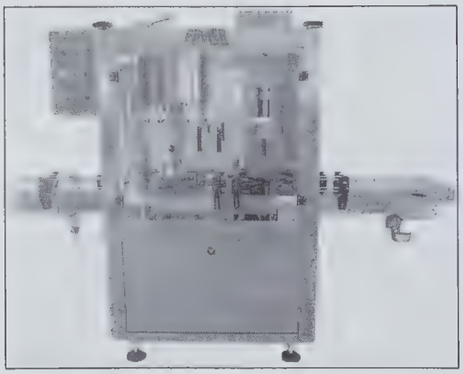

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Silverado Vineyards

Technologies in February 2003. The 3,500 cases/year winery installed 64 modular panels and four inverters. Half of the modules were installed on a shed with a south-facing roof and half on a custom-designed free-standing shade structure.

"The choice of the shed was an aesthetic and safety decision," says Will Seavey, son of owners Mary and Bill Seavey and the driving force behind their switch to solar energy. "We wanted to keep the winery building looking nice for visitors, and with so much activity around the main building (children often play there, for instance), any kind of objects could have landed on the roof and damaged the modules."

But because electricity loses force over distance, the fact that the power had to travel more than 500 feet to the appropriate meter presented a challenge. Darryl Conklin of RTI advised and installed transformers to "boost" energy as it traveled down a buried power line connecting the solar system and meter. The voltage is kept high, but "transformed" back to low voltage just before arriving at the meter. Thus the energy gets back to the meter at its full power rating.

Using the common method of multiplying the number of kilowatts in its system by the average number of hours of sunlight per day, Seavey estimates the solar energy system produces an average of 55 KWH per day. It produced up to 75 KWH of power on a long summer day, and they expect 35 to 40 KWH on cloudy winter days.

Seavey notes his monitoring of meter readings indicates the solar system provides two-thirds of the winery's energy needs. During the summer, the system has saved the winery about $450 per month, and savings in winter will be about $170 per month. The winery also received $40,000 back from the state rebate program on initial installation costs. "We estimate financial payback in five years," concludes Seavey.

Domaine Carneros

The new Domaine Carneros (Napa, CA) Pinot Noir production facility is one of the largest projects of energy efficiency ever attempted in the worldwide wine industry. When planning began on the winery's new 23,000 sq. ft. addition, it was decided to aim for maximum energy efficiency.

Overseen by Eileen Crane, president, Sid Lipton, (owner's consultant), and Wright Contracting (general contractor) [Santa Rosa, CA], the building's grand opening was on June 21, 2003 (the summer solstice). The construction included work from over 40 subcontractors and suppliers. PowerLight of Berkeley, CA, was the solar installer.

The 120 KW PowerGuard system consists of 688 lightweight solar panels mounted flat on the building's rooftop, and a single 120 KW inverter. The system initially cost $850,000, but the winery immediately claimed a PG&E rebate of $425,000. PowerLight projects a maximum potential of 90% efficiency from the system, which is expected to generate 40% of the winery's energy needs.

Maintenance of the solar panels consists of washing them off once or twice each month. Projected payback on the system is just four years, factoring in all tax credits, accelerated depreciation credits, the amount of power generated and its attendant utility savings, and the energy efficiency of the building itself.

In addition to 2-inch thick solar panels covering the roof and giving some sun protection, the winery installed R35 roof insulation. Rigid foam insulation on the exterior face of concrete block walls contributes to a total eleven inches of wall and insulation thickness.

Another feature of the building's energy efficiency is the Sunpipe® Daylighting System. Instead of installing traditional skylights which offer unfiltered light through large openings in the roof (thus allowing heat in, which is counter-productive), Lipton did some Internet research and found the Sun Pipe Company in Elgin, IL. Greg Miller is Sun Pipe's owner and co-inventor of the system.

"Sun Pipes 'pipe in' daylight from above the roof using aluminum pipes with a super-reflective interior," explains Miller. "Fifteen 21-inch diameter, 5-foot long Sun Pipes were installed between solar panels on the roof to illuminate the fermentation cellar with diffuse daylight. The diffusion occurs at the bottom of each pipe (18 feet above the floor) via a white diffuser dome which glows with however much daylight is available."

"The greatest category of energy savings is not electric lighting," notes Miller. "It's HVAC savings. Sun Pipes remove only 1/10 of the roof insulation that skylights remove, and they introduce comparatively little solar heat gain. This translates into massive HVAC energy savings for air-conditioned spaces.

Napa Valley Winery Employs Missile Defense System?

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"The greatest financial reward is the effect that daylight has on employees. Fewer sick days, fewer vision and attention-related accidents, and increased productivity are some of the human benefits of daylighting a workplace."

Mike Davidson of Industrial Refrigeration and Process Piping (Healdsburg, CA) worked on energy-efficient refrigeration for the facility. "The industrial refrigeration system installed at Domaine Carneros consists of two 20-ton (a system designed for a future 20-ton compressor) open-drive, reciprocating compressors with external capacity control," explains Davidson, "connected to a flooded glycol chiller providing cold glycol to the winery's new fermentation tanks and barrel storage room.

"This system uses many efficient components, but two of the primary benefits of the newly installed chiller system are the flooded glycol chiller and operation of the programmable logic controller (PLC) installed on the package.

"The flooded glycol chiller is significantly different than a conventional direct expansion-fed shell and tube chiller. Flooded chillers operate based on natural convection due to the difference in densities between the solid column of refrigerant liquid feeding the chiller and the gas/liquid mixture being boiled by the glycol (heat is absorbed by the glycol returning from the system)."

Some of the energy-efficiency benefits of the flooded glycol chiller include: substantially higher heat transfer coefficients; more efficient use of the heat exchanger surface; a wider range of operating temperatures; and the system can obtain a closer refrigerant-to-glycol approach temperature (as close as 3°F), which increases the compressor's capacity and reduces its horsepower requirement.

A programmable logic controller (PLC) installed on the package provides a measure of energy efficiency, adds Davidson. "This method of compressor loading and unloading provides precise control without over- or under-shooting the target temperature, which yields a much smoother system operation and reduction in electrical usage through reduced demand and use charges."

Crane is proud of the finished facility. "The installation marks a significant milestone in Domaine Carneros' continuing efforts to achieve sustainability in the production of premium wines."

Ridge Lytton Springs Winery

Solar energy panels were installed at Ridge's new Lytton Springs 18,000 sq. ft. facility (Healdsburg, CA) in September 2003. The new facility will produce red wines, predominantly Zinfandel, and like Domaine Carneros, was designed with energy-efficiency in mind. (See January/February 2003 *PWV*.)

The 66 KW PowerLight system contains two panel arrays on two slopes of the rooftop. The roof is pitched at 17 degrees and 35 degrees on slopes facing due south. The panels were installed a few inches above the roof, thus doing double the cooling work by blocking sun

Air for sale.

Many feel that wine aged in traditional oak barrels tastes best, and few if any will argue the contrary. The gap is closing however, and various oak integration systems have come a long way from where they were ten years ago. Enough to astonish reputed tasters, and find their way into reserve programs. One of many refinements has to do with micro-oxygenation, or helping a wine breathe right to properly mature. We've closely observed the way a barrel tends to breathe life into its guest. How a stave, when toasted by fire just right, can affect the composition of a red or white wine. Where did that stave come from? Was it dried in open air for three years? Asking a lot of questions has equipped us with many answers for those who might consider it audacious to compare barrel flavors to alternative techniques. If you need more convincing, please give a call. We have a glass of wine we'd like you to taste.

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Evergreen Valley Winery crushes grapes using an electric crusher powered by golf cart batteries, which are charged by the winery's solar energy system.

and by allowing cooler air to circulate along the surface of the roof.

Ridge's system has two 30 KW inverters. It is expected to generate 80,000 KWH/year and was set up for net metering so that Ridge can sell excess power to the utility grid at peak times. Mark Vernon, chief operating officer at Ridge Vineyards & Winery, anticipates that the winery will use most of the energy it produces, given the size of the facility, but says it's a bonus that the winery will be in need of the largest amount of energy at the same time that it is producing the most — in the summer and harvest months.

PowerLight helped Ridge file all its paperwork for incentives and net metering. The winery recouped 50% of the initial cost of the system in rebates, and is eligible to receive up to 25% more of the cost back in tax credits from the state and federal governments next tax year.

Evergreen Valley Winery

Evergreen Valley (Luthersburg, PA) is uniquely located to use solar energy. Owners Mark and Lorraine Gearhart planted a 10-acre vineyard in a reclaimed strip coal mine in Pennsylvania Amish Country, where little electricity service is available.

The winery is not connected to an electric power grid. "There is no cash incentive program in our area to install solar or wind power, and a substantial power company charge to even hook us up," says Gearhart. "So we opted out totally and built our winery and home here to require *no* outside power."

The winery building is on a ridge, with solar panels installed facing south at a 45-degree angle. In 1991 when he established the vineyard, Gearhart installed one 40-watt solar panel and a windmill. In 1997, six 100-watt solar panels were added. In 2003, a second windmill and six more panels brought the total energy production to 1.25 KW. Gearhart, a licensed professional engi-

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neer, aims to eventually increase the solar energy capacity to 2.5 KW.

Since there is no electricity grid to accept power, the winery uses 18 200-amp, 6-volt golf cart batteries to store energy. The batteries can hold a combined total of 20 to 25 KW of energy. The six bearing acres of vineyard yield about two tons each. The winery has crushed up to 12 tons per year using an electric crusher and a Willmes bladder press. Solar and wind power meet all the winery's crush, bottling, computer, cash register, and lighting needs, as well as powering Gearhart's home.

"We don't have the large numbers of installed panels that others do, but without a tax incentive, we have accomplished a totally self-sufficient business on that tiny amount of energy by being very efficient in the way we use what we do have. We're about wine first — we're big on things like battery-powered forklifts and other labor savers."

Stargazers Vineyard

Stargazers Vineyard (Coatesville, PA), a 2,000-case winery with 14 vineyard acres in southeastern Pennsylvania, is on an electrical grid, so the winery was able to take advantage of public utility rebates, and state and federal tax credits to defray some installation costs. Accelerated depreciation credits mean the winery will see payback on their system in 15 years.

Owners John and Alice Weygandt strive to keep their operations and home "green." The winery, built into a hillside, requires no additional heating or cooling. Their nearby home is a passive solar "envelope" design. Rainwater collected in cisterns from the winery rooftop is used for cleaning in the winery.

A 30-panel solar energy system will generate up to 4800 KWH/year of power for electrical needs. The BP solar panels are on the south-facing winery roof, which has a 26° slope.

Prior to going solar, the Weygandts purchased electricity from The Energy Cooperative, a Philadelphia-based nonprofit electrical supplier which purchases solar energy from residences and businesses who become renewable energy producers. Now Stargazers Vineyard has become an energy producer, and plans to sell any excess energy produced by the solar system to the Energy Cooperative.

Rodney Strong Vineyards

Installation of a 766 KW system from PowerLight at Rodney Strong Vineyards (Healdsburg, CA) in October 2003 became the largest solar energy installation in the wine industry. Installed on a south-facing roof of the winery's 100,000 sq. ft. barrelhouse at a 5° slope, 4,032 panels with three large inverters make up the system. The panels are fixed, but mounted a few inches above the roof to give both shade and cool airflow along the roof.

Tobin Ginter, chief financial officer, was instrumental in crunching the numbers and pushing to install solar energy. He reports the gross cost of the large system to be about $4 million, but the net will be only half that, and payback will take about nine years. The system should supply most of the 600,000-case winery's power needs, averaging 250,000 KWH per month of energy output, and peaking during harvest at up to 420,000 KWH per month.

PowerLight also installed new lighting at Rodney Strong Vineyards for further power savings. Over 400 high-efficiency, linear flourescent fixtures and lamps with electronic ballasts were placed throughout the wine production and case good storage areas. The system includes sound and motion sensors so that only occupied areas are illuminated.

The new lights generate less heat than older lighting at the winery, reduce lighting electric demand by about 500,000 KWH per year, and deliver light at a higher color rendering index (CRI), which matches natural light closely, increases visual acuity, and makes the lighting more comfortable to the human eye.

"Solar electrical systems have never been more suitable to our industry," notes Tom Klein, chief executive officer. "The combination of solar technology improvements with customary flat-roof winery buildings and their sunny locations, have made renewable energy more commercially viable."

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Never a better time

The wineries and renewable energy companies in this report all stressed that now is the time for wineries and vineyards to get solar or other renewable energy installed if they can.

State and federal incentives have never been better. But state incentives are beginning to diminish as funds, such as the CEC Renewable Energy Program, run out with no sign of replenishment from the financially-depressed state of California. In addition, the California tax credit reduces by half in 2004.

Darryl Conklin of Renewable Technologies, Inc., (RTI) has appeared before state committees with proposals and recommendations for keeping and increasing incentive programs. A fierce advocate of renewable energy, he fights not only to educate government officials but the general public also. RTI has built a special trailer containing working examples of wind and solar power to take to schools and businesses for demonstrations.

"It's a continuing fight for education and funding," Conklin says. "We have to fight the utilities also. PG&E wrote legislation to charge net-metering energy producers a nickel per kilowatt to send power to the grid with the argument that PG&E built the grid in the first place. Luckily that got defeated."

At a March 2003 hearing before the California Energy Resources Conservation and Development Commission, Conklin recommended that the commission, from its budget, send at least $1.35 million annually to the Renewable Resources Consumer Education Account, and $6.08 million annually to both Emerging Renewable Resources and to the New Renewable Resources Account.

Conklin also seeks better oversight of utility companies to ensure that renewable energy producers are getting what they should from net metering and other systems, and that monopolies don't strangle small businesses as renewable energy producers.

He also encourages regulations that don't choke renewable energy systems and eat up allocated funds which could otherwise go to encourage more consumers to become renewable energy producers.

Exploring solar energy

Wineries and growers who consider using solar energy should consult their state renewable energy advisory agencies (see Resources at end of this report), and work closely with the solar provider they choose to file all paperwork required and meet all deadlines to receive rebates, tax credits, and depreciation incentives. They should also carefully review how net-metering works within their local utility system if they intend to produce enough power to feed back to the power grid.

Actually receiving money back on a solar installation depends on careful, informed planning beforehand. ■

Resources

Barry Cinnamon, Akeena Solar, 605 University Ave., Los Gatos, CA, 95032; Tel: 408/395-7774; Fax: 408/395-7979; www.akeena.net.

California Franchise Tax Board (for state tax credits), www.ftb.ca.gov.

California Energy Commission, 800/555-7794, email: renewable@energy.state.ca.us; www.consumerenergycenter.org.

Ezra Green, Clear Skies Group, 757 Harrison St., West Hempstead, NY, 11552; Tel: 877/825-3374, www.clearskies group.com.

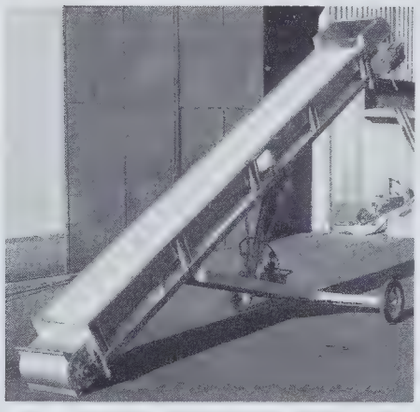
Mike Davidson, IRAPP, 1160 Industrial Rd #2, San Carlos, CA 94070; Tel: 650/595-0665; Fax: 650/595-0994.

Premier Power Renewable Energy, 4961 Windplay Dr., Suite 100, El Dorado Hills, CA, 95762; Tel: 916/939-0400, www.premier power.com.

PowerLight Solar Electric Systems, 2954 San Pablo Ave., Berkeley, CA, 94702; Tel: 510/540-0550; Fax: 510/540-0552; www.powerlight.com.

Darryl Conklin, Renewable Technologies, Inc., PO Box 1569, Sutter Creek, CA, 95685; Tel: 209/223-3002; fax: 209/223-3780, www.Renewable.com.

Greg Miller, The Sun Pipe Co., Inc., PO Box 5760, Elgin, IL, 60121; Tel: 847/888-9222; Fax: 847/888-9444; www.sunpipe.com.



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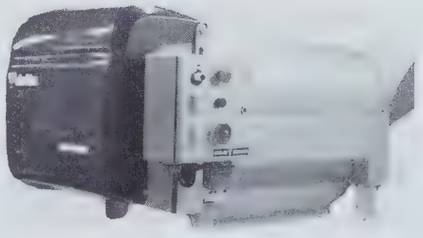

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New choice for tartaric stability

BY Don Blackburn, Enologist, Vinovation
Carl DiManno, Research Enologist
Winesecrets

Winemakers have been concerned in recent years about protecting consumers from the off-putting presence of tartrate crystals in bottled wine. With many horror stories about consumers finding "glass crystals" in the bottom of a wine bottle, the solution has been to subject the wine, in tank, to the same conditions that would precipitate the problematic tartrates in the bottle.

Chilling wine to near-freezing temperature for seven to 10 days has been shown effective in making wine cold-stable in the bottle. But what winemakers have given little consideration to is whether keeping wine at near-freezing temperatures for seven to 10 days may harm the organoleptic character of a wine.

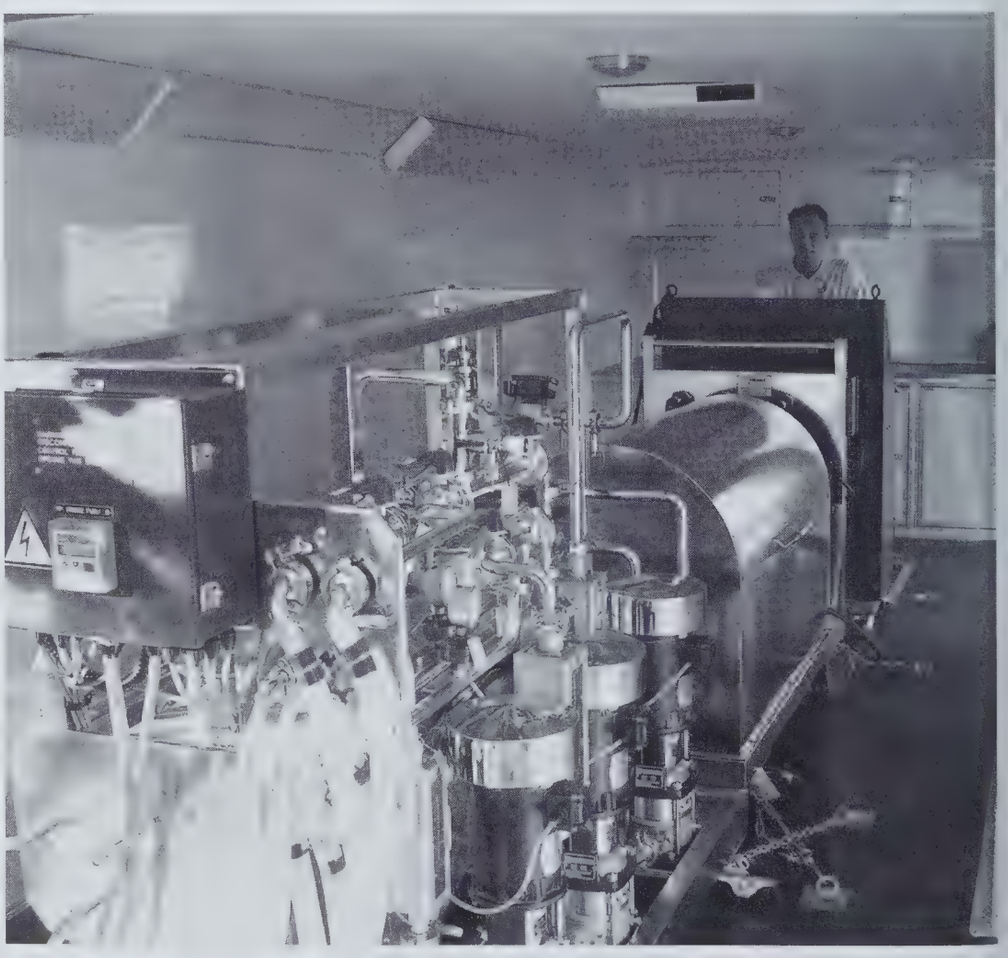
The presumption that low temperature should not adversely affect wine quality is in keeping with the 19th century model developed by German chemists. They treated wine as an "aqueous solution" and thus suitable for manipulation in processes such as filtration, centrifugation, and subjection to temperature extremes.

However, low temperature tank stabilization may have a disruptive effect on a wine's mouthfeel and probably contributes to a loss in wine flavor and the condition called "bottle shock." Concentrations of the proteins and other macro molecules can affect the volatility of aroma substances in wine, affecting wine sensory properties.[3]

We are beginning to appreciate the harm done to a wine via the adsorptive effect of membrane filtration, in which wine components cling to a membrane whose pore size would nominally allow their passage. This organoleptically perceptible stripping is what the aqueous solution model fails to reflect. The wine texture impoverishment caused sequentially by chilling and tight filtration may constitute a one-two punch, from which the wine suffers during the 12 months of its sales campaign.

It has also been documented that tartrates are not all that is lost from the wine during the process (Aude Vernhet, K. Dupre, et. al.) "Composition of Tartrate Precipitates Deposited on Stainless Steel Tanks During the Cold Stabilization of Wines. Part I. White Wines and Part II Red Wines." Following cold stabilization, researchers examined residual solids and determined the presence of phenolic acids, polysaccharides, various proteins, and tannins.[6,7] Removal of these compounds potentially affects aroma, mouth feel, flavor, and color.

How can winemakers accommodate the consumer's demand for crystal-free wine without paying a penalty in wine flavor and structure? Europeans have preceded the U.S. in developing an electrodialysis-based tartaric stabilization method that offers a clear



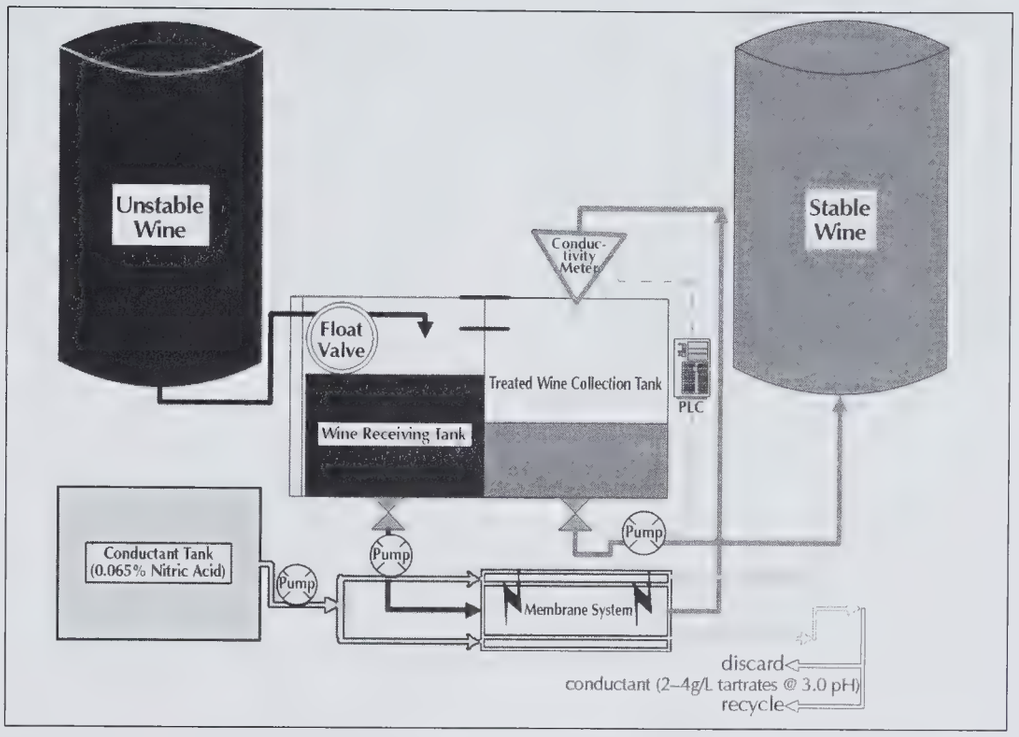
WineSecrets mobile STARS unit capable of providing tartaric-stable wine at a rate of 600 gallons per hour.

alternative to cold stabilization. How to make wine that is tartrate-stable without the loss of any other quality is no longer theoretical. The introduction of a tartaric stabilization method based on electrodialysis (ED) offers an alternative that is worthy of consideration.

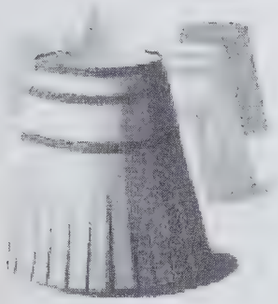
ED prevents precipitation of potassium bitartrate (KHTa) and calcium tartrate (CaTa) by removing their precursors, potassium (K^+), calcium (Ca^{++}), and ionized tartaric acid (Ta^-). Wine passes between (not through) two membranes, with a weak electrical charge potential across the system. Electromotive attraction selectively removes the cations (K^+, Ca^{++}) and anions ($Ta^=$) associated with tartaric precipitation.

Cations pass through a selective cation membrane and anions through a selective anion membrane. Once through the membranes, the ions are swept away by an aqueous solution.

The system is gentle, operating at a pressure of three bars or less. The ED-



How STARS works: Wine is passed through the membrane system. Conductivity is monitored as the wine returns from the membranes. Tartaric stability is usually achieved in a single pass.



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based Selective Tartrate Removal System (STARS) includes an analytical method to determine the change in conductivity required to ensure stability. The process is controlled by the change in conductivity resulting from removal of these salts.

There are several practical benefits of an ED-based system. First, data is accumulating to show that this method is less disruptive to the wine's organoleptic structure than is low temperature. Second, it offers a dramatic energy cost-saving to the winery, a particularly attractive benefit given the recent escalation in electricity bills. Third, it reduces wine loss. Fourth, it permits a winery to stabilize a wine on the day of bottling. Tartrate removal with ED costs as little as $.01 per bottle, whereas the standard alternative costs $.03 per bottle.

The concept of utilizing ED for tartrate removal is not new. E & J Gallo Winery experimented with electrodialysis as a tartrate removal system or as an adjunct to cold stabilization in the late 1960s. According to Arthur Caputi, former vice president of technical services, "The technology was not new. The Germans had published on this in the 1950s."

The early Gallo ED trials were only partially successful. While the concept was sound, the ion exchange membranes available at that time did not permit the full potential of the technology to be implemented for all wine types.

Work continued on ED for wine stabilization in Europe. In 1976, K. Wucherpfennig published "Impediment to the tartar separation with electrodialysis," documenting continued issues with the technology.[8] In the mid-1980s, membrane technology research at INRA (National Institute for Agronomical Research in France) provided excellent results. The technology selectively removed tartrates from wine. However, it remained too expensive to utilize commercially.

During the 1990s, Eurodia Industrie commercialized electrodialysis for wine tartrate stabilization in France. Working closely with INRA and membrane manufacturer Tokuyama Corporation in Japan, Eurodia developed an efficient and economical method for tartrate removal.

The International Office of Vineyards and Wines (OIV) has recognized ED as a "good practice." In 1997, the OIV authorized the use of ED for *Vins de Tables* and *Vins de Pays*. In 2003, a request was submitted by INRA to extend the authorization of ED treatment to A.O.C. (Appellation d'Origine Contrôlée) wines.

Research on ED in France has been extensive. Trials using ED were performed in Bordeaux in 1992 by the C.I.V.B.; in Champagne in 1995 by the C.I.V.C.; in Burgundy in 1997 at the Bichot Winery; in Champagne in 1998 by Duval Leroy; again in Bordeaux in 1998 (simultaneously at Ets. Cordier and at Ginestet); and in Beaujolais in 1998 by Georges Duboeuf. That same year, work also occurred in Germany in the RheinlandPfalz, in Portugal at Quinta Do Minho, and in Italy at the Bolla Winery of Verona.

Additional research has been done elsewhere. The 1992–1998 data sources were collected by the Pech-Rouge branch of INRA, and comprehensive results were included in the 2003 report sent to the O.I.V.

The report features the following points in its discussion of 1992–98 European experiments. A summary of observations of wines stabilized using ED concurs that:

- pH was diminished by generally less than 0.1, never exceeding 0.15.
- Volatile acidity was diminished by well under 0.12 g/L.
- Ethanol was diminished by less than 0.1%.

Overall, the characteristics of wines stabilized using an ED-based system fell within the guidelines established by INRA and validated by European Economic Community legislation. A thorough evaluation of red wines showed that ED-treated wine has minimal changes in total phenols, and total anthocyanins, whereas cold treatment led to comparatively large alterations. ED-treated red

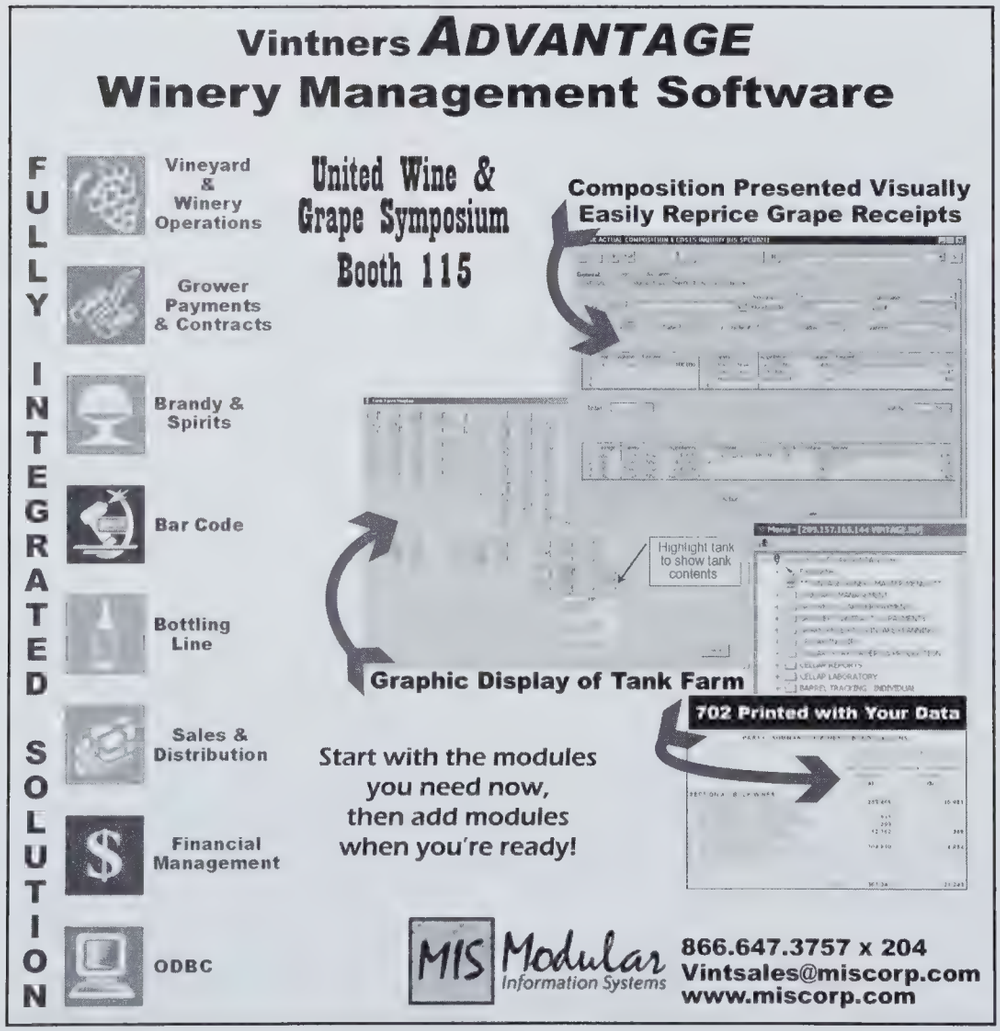

Table I: Selected enological data for Fetzer 2002 Sauvignon Blanc

	Before treatment	STARS treated	Cold-stabilized
Alcohol (%)	13.22	13.16	13.03
Volatile Acidity (g/L)	0.28	0.24	0.26
Titratable Acidity (g/L)	6.22	5.98	5.76
pH	3.29	3.20	3.21
Tartaric Acid (g/L)	2.84	2.53	2.50
Potassium (mg/L)	640	495	510
Calcium (mg/L)	87	66	97
Conductivity at 0°C (% change)	9.7	3.7	NA

wines showed diminutions in catechins and leucoanthocyanins, but much less so than cold-treated reds.

ED-experimentation protocols include sensory analysis, generally based on the "triangle" test. Differences of freshness, olfactory intensity, and length have been noted by winemakers tasting after ED-treatment and at recent wine industry conferences, sometimes in favor of the cold-stabilized wine, sometimes in favor of the ED-treated wine. That ambiguity should be considered a success, because ED was being evaluated to see if it merits acceptance as an alternative to refrigeration-based processes for stabilization.

ED need not now be shown as consistently superior, since practical advantages weigh in on its side. In trials with wines requiring acidification with tartaric acid or with lactic acid, the ED wine had superior aromatic intensity and elegance.

Today, more than 20 stationary units are operating in European wineries, including Skalli in Sete, France; Société Rémy Pannier in the Loire region of France; Bolla in Verona, Italy; and Fratelli Girardelli in Bardolino, Italy. Mobile services for the technology are available throughout Italy, France, and Spain.

The 90-hectoliters-per-hour (2,400 gph) unit at Skalli was the first stationary unit installed in a commercial winery. Installed in 1998, the unit has consistently stabilized 100,000 to 120,000 hectoliters of wine per year. Wines stabilized with this equipment have been sold in the U.S. under the Fortant de France label.

The STARS ED-based method is now available for use in North American wineries, through Winesecrets of Napa, CA. Several California wineries conducted trials with Winesecrets' STARS unit during the 2003 bottling season with satisfactory results. Treated wines passed winery stability tests.

Analytical results confirmed that ED is more selective than cold stabilization. ED removes tartrate precipitate precursors, with minimal impact on other wine constituents. Winemakers often either found no difference or preferred the STARS-treated wines. Sensory evaluations were consistent with those observed during the European studies.

In 2003, Fetzer Vineyards (Hopland, CA) conducted tartaric stability trials using conventional stabilization and STARS to evaluate results in Sauvignon Blanc and a Syrah Rosé with deep color. An independent laboratory analyzed the wines for various enological parameters and compared the results, which are summarized in Tables I and II.

In the Sauvignon Blanc, STARS provided tartaric stability with a lower impact on other enological parameters, including alcohol and titratable acidity. The impact on pH and volatile acidity were essentially the same as with conventional cold stabilization.

In the Rosé, STARS had a lower impact on titratable acidity, leaving higher levels of tartaric acid in the wine. Both red color (Abs. 520nm) and brightness (Abs. 420nm + 520nm) were unchanged by the STARS treatment,

Table II: Selected enological data for Fetzer 2002 Syrah Rosé

	Before treatment	STARS treated	Cold-stabilized
Alcohol (%)	13.83	13.82	13.83
Volatile Acidity (g/L)	0.32	0.32	0.32
Titratable Acidity (g/L)	7.26	7.07	6.96
pH	3.22	3.16	3.19
Tartaric Acid (g/L)	3.82	3.49	3.34
Potassium (mg/L)	780	625	640
Calcium (mg/L)	83	67	100
Conductivity at 0°C (% change)	8.9	3.0	NA
Red (Abs. 520nm)	1.35	1.36	1.25
Brightness (Abs. 420nm + 520nm)	2.14	2.14	1.99

while cold stabilization had a considerable impact on these parameters.

Fetzer winemaking personnel were pleased that there were no negative results from using ED. "ED can have a positive impact in the cellar, requiring less energy to cold stabilize wine and the working conditions in the cellar will not be so cold and harsh for cellar workers," reports Cara Morrison, Fetzer Vineyards.

Tartrate removal by electrodialysis has been reviewed and accepted by the US Alcohol and Tobacco Tax and Trade Bureau (TTB). The technology was approved for experimental use in July 2002. The TTB Laboratory in Walnut Creek, CA, performed analysis on wine samples submitted from STARS trials during 2003 and was satisfied with the results. In September 2003, the TTB decided to allow wine producers to implement STARS as a new winemaking process. This application takes the form of a simple notification letter.

The obvious conclusion to be drawn from this body of experience and research is that the STARS technology deserves to be considered as a legitimate option for winemakers who are interested in trying a new means of reducing energy costs, or are concerned that cold stabilization may be more harmful to wine quality than is widely appreciated. ■

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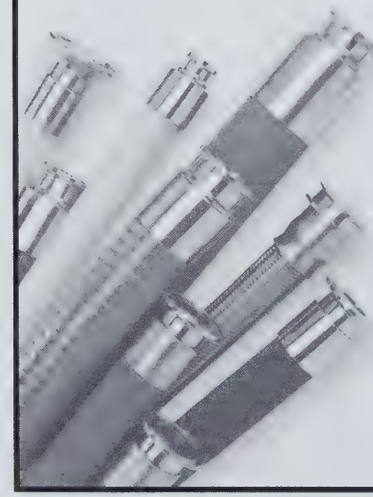

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VINEYARD INVESTMENT

It's always darkest just before dawn

BY John Bergman & David Ashcraft

Feelings of doom and gloom have cast a pall over California's wine country in recent years. Banner headlines have been proclaiming all manner of bad tidings, from overplantings and a flood of imports to a fall in grape and grapevine prices. Nevertheless, some reports have already been heralding a "worst is over" theme that cites the industry's many strengths and its historically cyclic nature.

All of this has served to remind us that the wine business is not immune to tough times, which in turn, affects vineyard values. As any student of economic cycles knows, it is important to study the past in order to help predict the future.

Business as usual

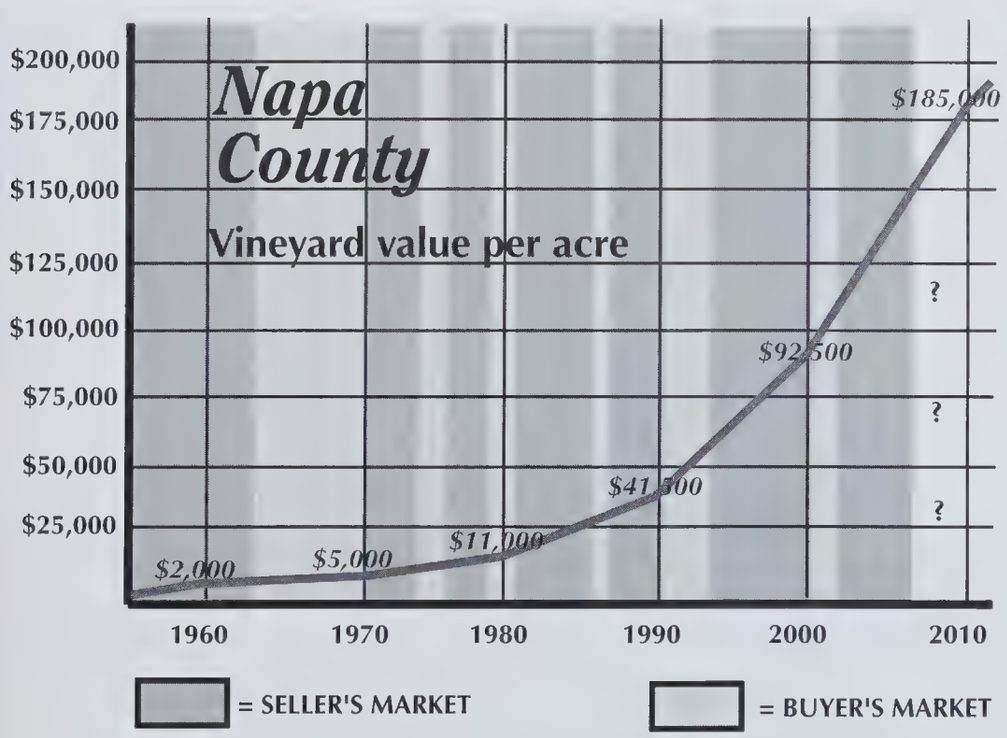
The November/December 2002 *PWV* published our report on "Vineyard investment cycles and the next decade." We reported setbacks encountered over the last four decades. The early 1990s was one of the worst economic periods for vineyard and winery owners in the last 50 years, with almost as many bankruptcies as were seen during Prohibition.

In 1993, no grapegrowers would have believed that their vineyards would more than double in value by the end of the decade. Nevertheless, by the end of the 10-year cycle from 1990/2000, vineyard values jumped 123% in Napa County and 191% in Sonoma County. The article also included our thoughts concerning the current vineyard/winery business cycle from the year of 2000 well into 2004 and 2005.

As we see it, a "buyer's market" began to develop in early 2000, and it has continued through today. The reasons were (and remain) clear:

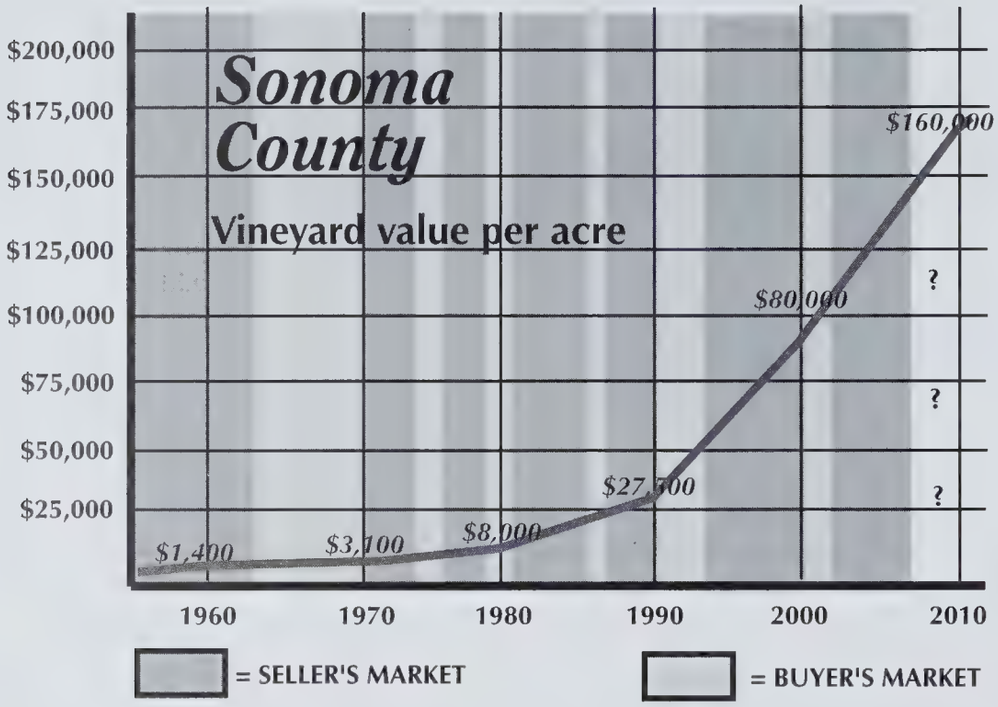
- Many new vineyards coming on line;
- The stock market collapse;
- An increase in grape supply after 9/11;
- The war on terrorism;
- Concerns over the economic recession;
- The drop in grape prices;
- A softening in vineyard prices.

One year after the "vineyard cycles" report was published, we are turning the corner toward better times. In 2003/2004, we should be at the bottom of the cycle, moving away from the negative effect on the vineyard and winery industry created by the events listed above. Based on historical trends and some positive signs within the industry, we feel that the turnaround is coming soon.



Percentage Increase By Decade

Years	Napa
1960 - 1970	150%
1970 - 1980	120%
1980 - 1990	277%
1990 - 2000	123%
2000 - 2010	100%



Percentage Increase By Decade

Years	Sonoma
1960 - 1970	121%
1970 - 1980	158%
1980 - 1990	243%
1990 - 2000	191%
2000 - 2010	100%

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All aboard!

In late 2003, it is our opinion that we (as grapegrowers) are in the worst of the bad times right now. There are indicators that the economy at large is beginning to turn around. If our predictions were right one year ago, by mid-2004 vineyard owners should begin to see the light at the end of the tunnel. The wineries should be paying more money for grapes starting in 2004, and wine sales should begin gaining ground as well.

Since grapegrowers will be a lagging indicator, one must think of the upward momentum like a locomotive slowly starting and gaining steam over several years. At this point the train conductor is checking tickets and getting ready to yell out "All aboard!" It won't be long until vineyard values begin to increase again. Newcomers will not want to miss this train.

Some strong indications that a turn around may follow soon are:

- The Dow component of the stock market has climbed 30% since the beginning of 2003, to or near its high over the past three years;
- Unemployment is showing signs of easing after two-and-a-half years of job losses;
- Grape prices are rising again for some varietals;
- Very few grapevines have been planted in the last three years;
- Tens of thousands of acres of grapevines planted in the Central Valley of California have been ripped out and re-planted to other types of agriculture;
- July 2003 had the strongest economic growth in the U.S. in three years;
- Upper-end wine sales are growing faster than sales of middle and lower priced wines;
- Last but not least, it appears that "Two Buck Chuck" (the $1.99 bottles of Charles Shaw wine that took the industry by storm in 2003) will have to be renamed "Four Buck Chuck."

What are the predictions for vineyard values in the next year or two? That is the proverbial "$64,000 question." The answer is that each vineyard will vary in value depending on viticultural area, location, condition, age of the vineyard, varietal, quality, contract, and demand.

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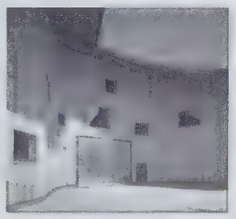
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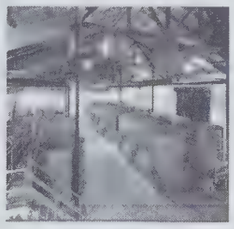
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What's hot? What's not?

Let's look at suggested grape prices for the 2003 crop and compare them to 2002 prices per ton. These recommendations are from the North Coast Winegrowers. The information will indicate which grape varietals are vulnerable, and, in turn, it will help determine vineyard values.

CHARDONNAY (Per ton prices)

County	2002	2003	Difference
Sonoma	$1,721	$1,700	– 1.2%
Napa	$2,317	$2,050	–11.5%
Mendocino	$1,169	$1,300	+11.2%
Lake	$1,092	$1,100	+ 0.7%

It appears that Chardonnay is heading back to a balance between supply and demand. Two years ago Chardonnay was a four-letter word; you could not give the grapes away. Sonoma is running about even, while Napa has been hit hard. Wow, look at the direction that Mendocino is headed. Even Lake County is expected to improve.

We've seen many Chardonnay vineyards that didn't have contracts in 2002 procure grape purchase agreements in 2003. We've also seen growers who sold Chardonnay in bulk wine do better than if they only had sold grapes. This leads us to believe that the market for Chardonnay is turning.

SAUVIGNON BLANC

County	2002	2003	Difference
Sonoma	$1,524	$1,500	–1.6%
Napa	$1,609	$1,700	+5.7%
Mendocino	$1,045	$1,000	–4.3%
Lake	$ 978	$1,050	+7.4%

Can we say Sauvignon Blanc is coming back? It appears it is again gaining ground in Napa and Lake counties, while Sonoma is holding strong, and Mendocino is slipping.

CABERNET SAUVIGNON

County	2002	2003	Difference
Sonoma	$2,696	$2,300	–14.7%
Napa	$4,020	$3,750	–6.7%
Mendocino	$1,899	$1,900	+0.1%
Lake	$1,803	$1,600	–11.2%

We have been saying for about 10 years now that with the younger fresh palates coming of age with their love for Zinfandel, Pinot Noir, and Syrah, Cabernet Sauvignon is beginning to take a back seat. It appears that the lighter,

fresher Cabernets from Mendocino are gaining ground, while Sonoma, Napa, and Lake are headed for adjustment.

MERLOT

County	2002	2003	Difference
Sonoma	$1,955	$2,100	+ 7.4%
Napa	$2,817	$2,750	– 2.4%
Mendocino	$1,579	$1,700	+ 7.6%
Lake	$1,383	$1,600	+15.6%

You know things are changing when Napa Valley, the king of Bordeaux varietals including Merlot, is seeing a price reduction in contrast to Sonoma and Mendocino. This is another indication that the cooler areas that produce lighter wines are beginning to be recognized by new, younger wine consumers. Nonetheless, Lake County is showing a stunning move in the right direction.

PINOT NOIR

County	2002	2003	Difference
Sonoma	$2,126	$2,000	–5.9%
Napa	$2,190	$2,100	–4.1%
Mendocino	$1,776	$1,800	+1.4%

These statistics reflect the overplanting of Pinot Noir in Napa and Sonoma. This varietal may have a few years of problems ahead. However, we do know that the finest quality Pinot Noir grapes are still in high demand by small "cult" quality winemakers. Top quality Pinot Noir is the most challenging grape to grow and is the most difficult wine to make. It is either very good or very bad to the taste; there are no middle-of-the-road Pinot Noirs in the marketplace.

ZINFANDEL

County	2002	2003	Difference
Sonoma	$2,495	$2,500	+ 0.2%
Napa	$1,934	$2,150	+11.2%
Mendocino	$1,412	$1,500	+ 6.2%
Lake	$ 858	$1,500	+74.8%

Which varietal is the hottest of them all? Sonoma County Old Vine Zinfandel is "King," especially from the Dry Creek Valley AVA. Howell Mountain Zinfandel in Napa is especially good also. Zinfandel saw a suggested price increase for four counties in 2003 with a dramatic increase in Lake County. So it's safe to say that Zinfandel is an "in" varietal.

ESTIMATED TONS HARVEST

County	2002	2003 Estimated	
Sonoma	183,139	143,000	–21.9%
Napa	130,099	129,000	–0.8%
Mendocino	59,128	55,460	–6.2%
Lake	24,966	25,000	0.1%

This year's harvest was expected to be lighter than last due to Mother Nature and the wineries' request for growers to drop fruit on the ground to achieve higher quality. The result should be less inventory and higher quality wines. Alas, the winner is always the consumer, as there are some great buys on great wine these days.

Projected vineyard values

We have seen a 20% to 30% drop in Napa, Sonoma, and Mendocino County vineyard values over the last few years. These percentages are not bad considering what has happened to the Central Valley and Southern California.

We predict that within one year we will see 7.5 % to 15% increases in the strong varietals, and that we will recoup our losses within 2.5 years. Remember, in the last 50 years, vineyards have increased in value no less than 100% every decade, and there is no reason for that to change now.

It is our opinion that we are at the bottom of this cycle, and we will soon see better times. This doesn't help those who have been devastated over the last few years, but for those who have survived, the good news is that eating beans will slowly change to steak and caviar again. ■

Readers thinking of selling their vineyard property are welcome to call for a confidential conversation. There is no obligation. Visit www.bergmanvineyards.com for more information.

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Michigan viticulturist receives 2003 Integrity Award

BY Andrew Wallace

After more than three decades of service to the development of Michigan's wine industry, Dr. G. Stanley Howell of Michigan State University (MSU) was chosen by the Lodi-Woodbridge Winegrape Commission (LWWC) to receive its 2003 Wine Industry Integrity Award.

Each year, the LWWC appoints a wine industry panel to select and honor a person who has conducted his or her career with integrity while making significant contributions to the industry.

Howell is the sixth to receive the award, joining an esteemed group that includes recent honorees Dr. Curt Ellison of Boston University's School of Medicine, who was instrumental in revealing the health benefits of moderate wine drinking, and Robert Mondavi, recognized for his vision and extensive contributions to the wine industry.

In its research, the selection panel discovered that Howell's career is characterized not only by integrity and significant research contributions, but also by being a source of inspiration to students and colleagues. He has also demonstrated continued loyalty to his region.

"More than any other individual, Stan has provided the fundamental research that has allowed the Michigan wine industry to grow in size and quality," says Gary Lemme of the Michigan Agricultural Experiment Station at Michigan State.

When asked why he has remained in Michigan, Howell declares, "I stayed based on the notion that tourism would enhance marketing of good wines in the Great Lakes region. All we needed was consistent production of good wines. I envisioned wineries and vineyards stretching across the region."

Stan Howell

Howell joined MSU in 1969, after earning bachelor's and master's degrees in horticulture at Mississippi State University and a doctorate from the University of Minnesota. He helped establish the first winemaking and grapegrowing program in Michigan at MSU two years ago (enrollment has doubled each year).

Michigan's potential

When Howell joined MSU, the state's wine industry was producing sweet dessert wines almost exclusively. "The majority of grape acreage was devoted to the juice, jelly, and jam markets," says Howell. "Of the 12,000 acres, most were Concord grapes. At the time, as one grower said, 'The wine industry (Michigan's) is not just the tail of the dog, but the tip of the tail of the dog.' That same grower eventually expanded his crop to include winegrapes, and last year grossed nearly one-half million dollars."

Howell helped introduce *vitis vinifera* species to Michigan, evaluating and conducting trials on grapevines that are now standard.

"To be taken seriously throughout the wine industry," says Howell, "We had to begin growing vinifera. "I began conducting trials. I knew that the wine business was, indeed, a business and that, although some wines are made for reputation, ultimately people want to make wines that pay the bills."

Michigan is now the fourth largest producer of grapes in the U.S., with 13,500 acres in production. Though the juice, jelly, and jam market still dominate, winegrape acreage has grown to 1,300 acres. In 2000, vinifera acreage surpassed hybrid grape acreage for the first time.

Winter hardiness

During his tenure at MSU, Howell has endeavored to gain a better understanding of grapevine growth and productivity under environmental conditions that are at, or very near, the limit of commercial viticulture. In Michigan where the winter cold can cause vine damage throughout the dormant season, vine culture that creates conditions to maximize the expression of whatever genetic potential exists for cellular, tissue, organ, and vine survival is a top priority.

Every year, frost removes leaves almost simultaneously with harvest. There is no lingering period post-harvest for vine recovery. There is also the problem of varying amounts of heat during the growing season. These two factors working together force Michigan growers to carefully culture and crop their vines or the fruit will not ripen acceptably and vines may be weakened and become more susceptible to winter cold. These are the top priorities in this region.

Key factors influencing success include variety selection and the matching of selected varieties to macro- and meso-climatic conditions in the region. This also means the region's grapegrowers must pay careful attention to both site selection and cultural practices such as: training system, crop load, rootstock, canopy man-

Honoring the House of Howell

Editor's note: *James Wolpert, PhD — chair, Department of Viticulture & Enology, UC Davis — introduced Dr. Gordon Stanley Howell Jr., PhD, who received the Wine Industry Integrity Award, October 2003. Below are Wolpert's remarks.*

When Stan Howell arrived at MSU in 1969, 90% of all Michigan wine was made from three American grape varieties: Concord, Niagara, and Delaware. But remember, 1969 was only four years after Robert Mondavi started his winery in Napa Valley. At that time, California was producing only slightly more dry table wine than sweet dessert wine — only slightly more, and much of that was still labeled without varietal designation. No one bottled Merlot. The white wine boom was still a decade away.

But, there was a sea change ready to hit the American wine scene and the question was: Who would make the change and who would be left behind? If I told you that 50% of medal-winning wines at the 2003 Michigan State Fair were made from vinifera grapes, I think you would agree that Michigan responded to the challenge.

Stan's career can be divided roughly into three major segments: The first decade was spent understanding grapevine cold hardiness: the susceptibility to frosts in the early fall and late spring or the reaction to devastating mid-winter cold events. The next decade was spent understanding how cultural practices could be used to minimize the impacts of all these cold events. The most recent decade has been focused on understanding how cool climate grapevine physiology can be harnessed with these improved cultural practices to maximize yield and quality.

What you may know about the man we honor is that:

- He grew up in a household in which alcohol was not served and yet has become an excellent wine taster and wine judge and one of America's best small-lot research winemakers.
- He was instrumental in bringing together for the first time the three components of Michigan's industry — the juice-grape growers, wine-grape growers, and winemakers — to work for common goals.
- He created Spartan Cellars (the Spartans are the MSU mascots), one of the finest research wine facilities on a university campus in the U.S.

What you may *not* know about this man we honor is that:

- He would ask us to pick grapes in the rain and prune vines in the snow and make us think it was a privilege (we now know that it was). "Just think of all those candy-asses back on campus," he would say. We vowed he would *never* describe us that way.
- He would encourage us to think critically about research, but if we offered up a poorly thought-out hypothesis, he would jump on it, firing back with a blistering line of reasoning as sure as Barry Bonds hammering a hanging curve ball. In that moment you would decide, like those pitchers, that it's just not *healthy* for your career to make those kinds of mistakes very often.
- Stan made everyone in his program — we all referred to it as the House of Howell — know that they were part of something special, to the point that all of us still refer to those times, now 20 years in the past, using the first person plural: "we." It wasn't just something we were doing, it was more than that — it was who we were. ■

agement, vine nutrition, and vineyard floor management.

Howell notes that Michigan grapegrowers are obliged to assess all these factors using a critical productivity/quality formula to determine whether the effort is economically justified. Growers must consider wine production in all vineyard evaluations. Finding that a previously non-cultivated variety or selection is excellent viticulturally is just the first step. Growers must also ask, does the excellence carry forward into wine quality? Does the modification of a cultural practice that increases yield reduce wine quality?

"Michigan grapegrowers must select robust winter-hardy varieties, such as Riesling, Chardonnay, and Pinot Gris, and marry vine hardiness with cultural practices that allow full expression of that robustness at economically acceptable levels," explains Howell. "Both quality and yield come into play in those calculations. In an increasingly competitive national and world market for wine, quality issues are critical to success."

Howell has written numerous reports, attended and spoken at many seminars, and traveled to prominent wine and grape production regions around North America and Europe (Switzerland) in order to help keep his region's grapegrowing practices on the cutting edge.

"The message that I have received and tried to share is that we must continue to work at improvement or we will be left behind," he notes. "The Michigan winery making the best wine in 1969 when I arrived was not operational by 1980. It had not grown and innovated with changing circumstances and expectations. That had a powerful impact on me, and I have dedicated my efforts to providing the best resources possible to ensure that Michigan's grape and wine producers could compete and prosper. I remain dedicated to that goal."

Modern day Michigan

Today, vinifera species Riesling and Chardonnay have a long track record of success in Michigan. Pinot Gris has recently generated interest. Howell reports that consistent production of wines from Pinot Noir, Cabernet Sauvignon, and Cabernet Franc is more difficult. With Pinot Noir, the concerns are vine survival (though clones 9 and 29 have been excellent) and harvest season cluster rot on the tight cluster clones.

With both Cabernet Sauvignon and Cabernet Franc, quality can vary widely in Michigan's cool climates. Depending on the growing season and crop load, herbaceous qualities can negatively affect wine. Growers, winemakers, and researchers continue to discuss ideas for vineyard and winery practices that could help reduce herbaceous factors.

Wine writer Dan Berger, a member of this year's LWWC selection panel, says, "In addition to Dr. Howell's many viticultural accomplishments, he has resisted tempting offers to 'go west' and has persuaded dozens of MSU viticultural graduates to remain in Michigan, to the great benefit of the region's wine industry."

Howell did, however, lose at least one prominent graduate to the West Coast — the current chair of the Department of Viticulture & Enology at the University of California, Davis, Dr. Jim Wolpert. "It is hard to know where the Michigan wine industry would be without Stan's guiding hand," Wolpert says. "The impact of his work is felt in every aspect of the industry."

Wolpert presented Howell with the Integrity award in October in Lodi, CA.

In the summer of 2003, Howell took a research leave from MSU to study and do research at UC Davis, and initiated a cooperative project studying Cabernet Franc based on similar experiments at the Oakville Station and the Southwest Michigan Research and Extension Center near Benton Harbor, MI.

His research plans will continue ongoing efforts to employ cultural methods to reduce cluster compactness and harvest season rot in Pinot Noir and Chardonnay.

While at UC Davis, Howell interacted with specialists on methods of sensory evaluation of fruit and wines while beginning to learn the complex methods for collection, analysis, and interpretation of such data; to gain insight into influences of canopy management on diurnal temperature fluctuations; and to improve his understanding of irrigation technology and vine/water relations. ■

Sunlight and Temperature

Continued from page 45

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In an ongoing effort to quickly share the latest applied research results with the wine and grape industry, the University of California, Davis (UCD), Department of Viticulture & Enology hosts its annual RAVE event on Thursday, March 18, 8:30 AM to 4 PM, in Freeborn Hall at UCD.

Chair Jim Wolpert will update attendees on current department activities and developments, and department faculty will present what's new on many topics. Four breakout sessions in the afternoon will allow attendees to ask in-depth questions and discuss issues.

The enrollment fee of $175 includes a box lunch. For more information or to enroll, please call 800/752-0881, 530/757-8777 in Davis or Woodland; email aginfo@unexmail.ucdavis.edu; or visit the website at www.extension.ucdavis.edu/winemaking.

Program Agenda

State of the Department, Jim Wolpert
Flavor Chemistry of Wine, Susan Ebeler
Genomics of Wine Lactics, David Mills
Unraveling an Olmo Mystery, Andy Walker
Micro-Oxygenation, Andy Waterhouse
Water Relations of Veraison, Mark Matthews
Pregnancy Test for Botrytis, Frances Dewey
Sensory Evaluation of Wine, Hildegarde Heymann
Effects of Irrigation and Canopy Management on Berry and Wine Composition of San Joaquin Valley Merlot, Larry Williams

First Breakout Session

#1 Pierce's Disease, Chairs: Andy Walker, Mark Matthews, Bruce Kirkpatrick of UCD Plant Pathology
#2 Wine Phenolics, Chairs: Hildegarde Heymann, Douglas Adams, Andy Waterhouse

Second Breakout Session

#1 Stuck Fermentation, Chairs: Linda Bisson, David Block, David Mills
#2 Precision Agriculture/Soils, Chairs: Dave Smart, Kerri Steenwerth, Jean-Jacques Lambert

SUTTER HOME WINERY

THIRTY YEARS OF White Zinfandel

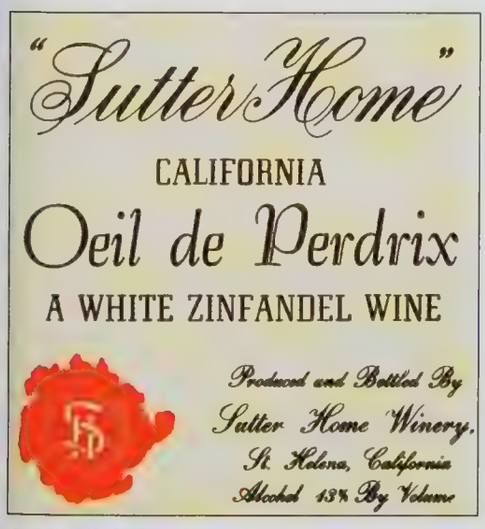
Bob Trinchero, Sutter Home CEO

BY Jack Heeger

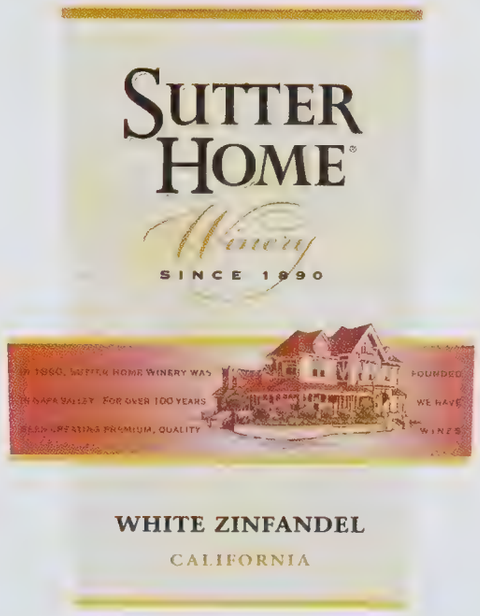
White Zinfandel, an accident that reigned as the number one table wine in the U.S. for a decade, turned 30 with the 2003 harvest. The first vintage, made from grapes harvested in 1972, was released in 1973 as a bone-dry, pure white wine by Bob Trinchero, who was then winemaker at his family's Sutter Home Winery in St. Helena, CA.

"I had 11 barrels of this dry, somewhat coarse white wine, but I was a serious red winemaker," he recalls. "I fermented it dry and was going to blend it into some Chablis and put (it) into gallon jugs. But Darrell Corti (owner of a Sacramento, CA, gourmet grocery and wine shop) tasted it and called it a 'curiosity.' He suggested bottling it and offered to buy one-half of the bottling."

Corti even suggested a name — *Oeil de Perdrix*, or "Eye of the Partridge." Trinchero submitted the label to the then-BATF for approval and was told it required a description in English. So Trinchero put "A White Zinfandel Wine" on the label under the French name, submitted it, and it was approved. Sutter Home sold it all that year directly from the tasting room.



A 1972 label



A 2002 label

If a similar situation arose today and Trinchero tried to put "White Zinfandel" on a bottle, "We'd probably have to say, 'White wine made from Zinfandel.'" But because it has now become a standard in the industry, the name prevails.

Makeshift system used

The first White Zinfandel was made through what Trinchero describes as a makeshift system. As he was crushing Zinfandel grapes, he wanted to take off 25 to 30 gallons per ton of juice to increase the intensity of the color and flavor of the wine. He ran the juice over a 12-foot-long screen with small oval holes (that shape is more efficient, he explains) and into a tank. When the desired amount was reached, he merely switched the hose so the juice ran directly into the fermentor. He was using the *saignée* process, although, by his own admission, he was not familiar with the concept at the time.

In the following year, however, "Red Zinfandel sales exploded and we needed all the juice for red wine," he explains. So no White Zinfandel was made in 1973. He resumed the procedure in 1974, and again the White Zinfandel was "bone dry."

But in 1975 the fermentation stuck, he was busy with other problems, and when he came back to the wine, "It was pink and sweet." Thus was born a new wine — and a small piece of wine history.

The ensuing popularity of White Zinfandel caused a sales explosion in the 1980s. Trinchero notes that, at one time, about 120 wineries were reported to be making it. "Today there are about four or five big players and four or five smaller ones," notes Trinchero.

"In 1980, we shipped 24,000 cases of White Zinfandel of a total 34,000 cases of Sutter Home wine. The amount of White Zinfandel more than doubled every year until reaching three million cases. In 1984, it was 500,000 cases, and in 1985 we tripled to 1.5 million cases. In 1990, we shipped three million cases and peaked at four million cases in 1996."

Sutter Home claims that White Zinfandel was the most popular table wine in America from the mid-1980s until 1994, when Chardonnay surpassed it.

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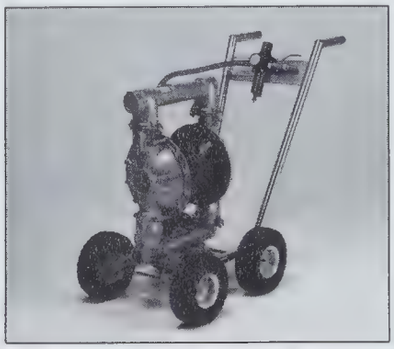

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When he first made it, other vintners "thought it was a flash in the pan," Trinchero recalls. "But when they saw how sales grew, they jumped into it. There are some people who predicted its demise (who) are upset because it's still with us."

Wine critics also remain on its case. "One wrote, 'I liked their (Sutter Home's) Chardonnay so much I almost forgive them for White Zinfandel,'" Trinchero muses.

But one of the most famous critics, the *Wine Spectator,* presented the magazine's Distinguished Service Award to Trinchero in 1994. Publisher Marvin Shanken said Trinchero "deserves credit for inviting a whole new segment of the population to try a glass of wine."

Harvest criteria: Acidity

In the early 1990s, Sutter Home began to pick grapes for White Zinfandel by acid levels. "We start picking at 0.7 gm/L or 0.65," Trinchero explains. "We aim for a TA/pH balance. We pick at about 17 or 18° Brix. When it hits 19°, we're finished." Alcohol level of the 1991 wine was 9.8%. "We try to stay around 10%."

The residual sugar of that first batch was about 2%, and Trinchero notes that since then the residual sugar has risen incrementally until the 2001 vintage reached 3.35%.

Though Sutter Home doesn't target residual sugar, about 2% Muscato is used to help sweeten it, he explains. "We can blend for color. We use Chenin Blanc or French Colombard. It all depends on how much Zinfandel we obtain and at what price. It affects the bottom line. We try to stay at 80% (Zinfandel juice), and we made a conscious decision to stay well above 75%."

The success of White Zinfandel caused a change in some production methods. "By 1978, we went beyond *saignée* and had to buy some juice," Trinchero remembers. About half the grapes are estate-grown, the rest are purchased. Today White Zinfandel is made from dedicated grapes, much of which come from all of 1,050 vine acres at the Arbuckle Vineyard in Colusa County, planted exclusively to Zin-

fandel in 1988. Trinchero describes the area as in the Sacramento Valley, in the upper reaches of the San Joaquin Valley.

"It was never the goal to use Arbuckle grapes for red wine," he says. "They've always been dedicated to white wine. We tried to make some red Zinfandel, but it was uninteresting. Arbuckle grapes are just not good for red." The Artois Vineyard in Glenn County, just north of Colusa County, has 640 acres planted mostly to Zinfandel, and part of this, too, is used for White Zinfandel.

The average yield is 15 to 16 tons per acre (TPA), but Trinchero notes as much as 22 TPA have been harvested, while the lowest yield has been about 12. All grapes are mechanically harvested at night, and delivered to the winery in early morning.

White Zinfandel is blended in 320,000-gallon batches, and Sutter Home bottles about 10,000 cases of 750 ml bottles and 9,000 cases (24/case) of 187 ml bottles of White Zinfandel daily in its Green Island Road facility in American Canyon.

'Freeway ageing' in convoys

Sutter Home Winery holds bottled White Zinfandel for at least one month before shipping, but Trinchero recalls the early days when they practiced what he refers to as "freeway ageing."

"We took it right off the bottling line, put it in trucks and had convoys heading to the marketplace," he says. "One supermarket in Southern California once had 1,660 cases stacked on the floor at one time, and claimed it was all sold within three weeks."

Montevina, another brand produced by the Trinchero Family, also makes a White Zinfandel, using the *saignée* process from grapes grown at Deaver Vineyard in Amador County.

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INTERVITIS-INTERFRUCTA 2004

Focus on viticulture in Stuttgart, Germany

BY Thomas Brandl

New technology for viticulture, fruit and fruit juice production will be on display at the tri-annual Intervitis-Interfructa trade show in Stuttgart, Germany May 11–15, 2004.

Intervitis-Interfructa expects more than 50,000 trade buyers from all over the world to view technology, products and services from more than 600 exhibitors in 645,000 square feet of display area.

In 2001, 30% of the exhibitors and 23% of buyers were from outside Germany. Intervitis-Interfructa now has a presence on four continents, and is aiming through this globalization strategy to develop, in particular, the expanding wine and fruit juice markets in the New World for its exhibitors.

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The International Fruit Juice Union (IFU) will hold its 2004 annual conference during Intervitis-Interfructa 2004. The International Federation of the Wine and Spirits Industry (FIVS) will also meet in Stuttgart.

A support program conducted in German and English, includes:

- East-West Forum on Investment and Financing Opportunities (May 10);
- 7th International Symposium on Technology Application in Horticulture and Viticulture (May 10–11);
- 7th International Symposium on Innovations in Enology (May 10–11);
- 1st International Symposium on Organic Fruit and Wine Growing (May 13).

Several hundred experts from all over the world are expected to attend the 7th International Symposium on Innovations in Enology, and the 7th International Symposium on Viticulture and Fruit Cultivation. The German Winegrowers' Association will hold a symposium on Ecological Viticulture for the first time on May 12 and 13.

A Distilleries Conference on May 15 is expected to be well-attended. The accompanying program will include a large tasting workshop on different methods of winemaking, and a trade fair forum entitled "Packing, Capping, Corking, and Sealing."

In view of the keen industry discussion on closures, exhibitors have announced a world premiere seminar on glass stoppers. Separate seminars will be devoted to ecological cultivation, sparkling wine technology, and the art of distilling grape and fruit products.

An extra add-on for groups only: talks with German viticulture experts on the latest technology trends. These can be arranged at the show.

Outside the trade show, visitors can enjoy a wide range of tourist activities in Stuttgart and the surrounding area. These include sightseeing tours of the countryside; choosing from among many musical, ballet, or variety-show performances; visiting the world-famous automobile museums of Porsche and Mercedes-Benz; a side-trip to the nearby wine-growing regions of Remstal, Mosel, and Rheingau/Heidelberg; a boat trip on the Rhine River, or a tour of the Black Forest. Information on all activities can be found at the show.

For further information and to pre-register, contact: Marlies M. Osmers, U.S. representative for Stuttgart Tradeshows, at 212-974-8841, or email to: stuttgarttradeshows@gaccny.com

For travel arrangements, contact Bob Brodsky at TTI Travel, New York, 212-674-3476 or e-mail: bbrodksy@ttitravel.net

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Sutter Home Winery

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New wine: White Merlot

Four years ago Sutter Home began to make a White Merlot, although it started out being called Merlot Rosé. "We changed the name to 'White Merlot,' and guess what?" Trinchero asks, leaving the impression that it started to fly off the shelves.

Does White Merlot compete with White Zinfandel sales? "I've never been afraid to compete with myself," he replies. The residual sugar is 4.0% and alcohol is 11.3%.

Grapes for White Merlot are sourced from the Sacramento Delta region, including Sutter Home's Delta Ranch Vineyard in Sacramento County. At present, 235,000 cases are produced annually.

Sutter Home *saignéed* white juice from some Cabernet Sauvignon from the 2002 vintage to slightly increase the White Zinfandel inventory and greatly reducing the red Cabernet inventory.

Trinchero gave up winemaking duties in 1986 and moved into administration. His last year as hands-on winemaker was 1985. He clearly misses the hands-on activity but cites the need to take care of the business side of the winery.

He did step back into the winemaking role however, by making a "2001 Zinfandel"—800 cases of Deaver Vineyard old vines, Amador County (14.95% alcohol) barreled in French oak for 15 months, bottled unfiltered. He describes the wine as "just like the 1969, the one I liked best. It was in the same style as in the 'old days,' with earthy flavors of raspberry jam, blueberry, cedar and spicy oak with chalky, mouth-coating tannin."

Trinchero's food suggestion with White Zinfandel

Does Trinchero drink White Zinfandel? "I drink it at least once a month, with oriental food. It goes with sweet and sour foods," he says. "I also enjoy it occasionally before a meal." ■

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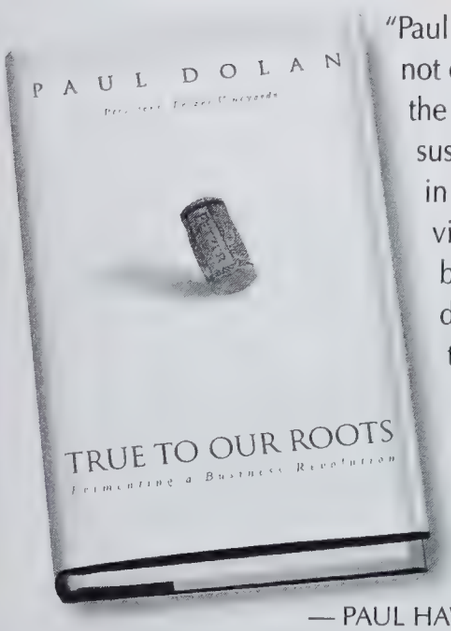

"Paul Dolan has not only led the way to sustainability in California viticulture but has demonstrated that one person in one company can transform an entire industry."

— PAUL HAWKEN, Author,
The Ecology of Commerce

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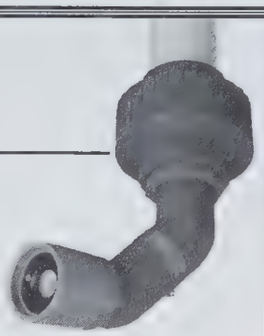

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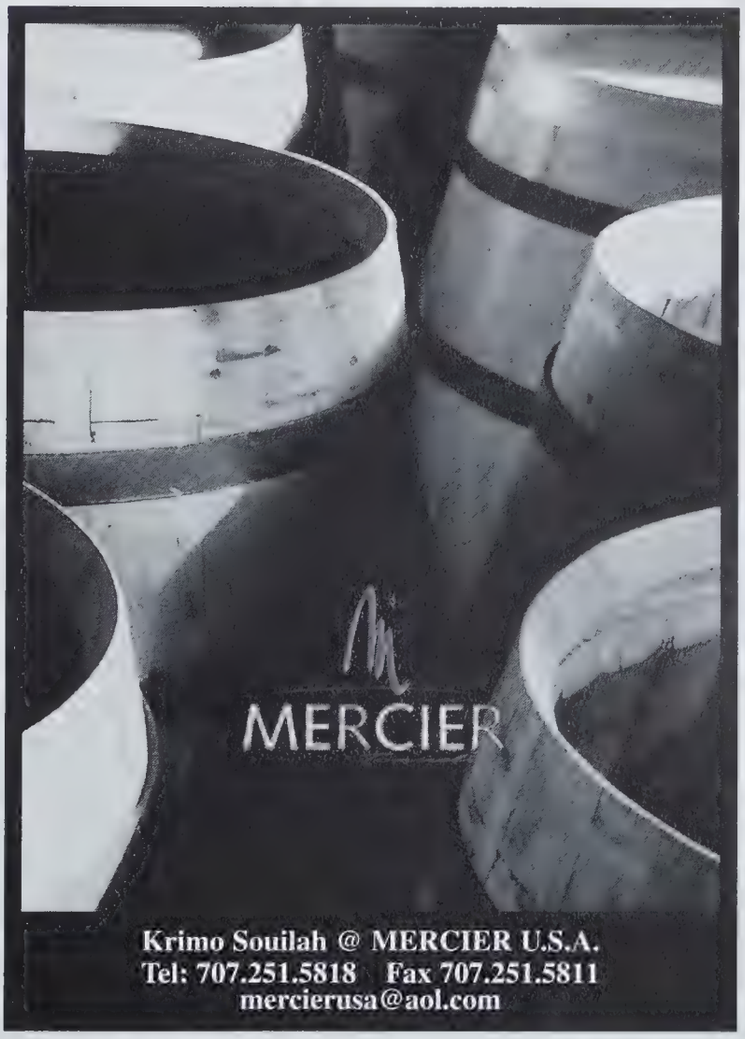

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JANUARY/FEBRUARY 2004

PRACTICAL WINERY & VINEYARD

SUPPLIER SHOWCASE

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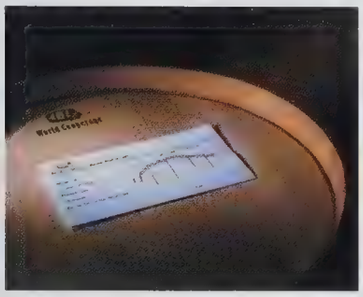
World Cooperage

World Cooperage's unique toasting technology, "Barrel Profiling," provides different barrel styles with diverse and definable flavor profiles and guaranteed repeatability and predictability. This innovation is in direct response to winemakers' request for consistency.



Research and development teams in Europe and the U.S. have been working on this toasting technology, combining the latest temperature sensors with a computer network and touch screen monitors. The cooper simply inputs the barrel's wood specifications and desired toasting profile and the computer directs the cooper to increase, decrease, or maintain the barrel's current temperature to follow the desired profile.

World Cooperage works in partnership with customers to define a tailor-made profile, or winemakers can review the company's existing portfolio of barrel profiles. Once a winemaker has chosen the desired profile, World Cooperage uses the new toasting technology for perfect replication.

World Cooperage also produces Oak Alternatives with the same care as its barrels. Tank staves, Barrel Renewal Systems, oak chips, and powder are toasted and monitored using similar infrared temperature sensors. Custom toasting is available. Also popular are High Vanilla oak chips.

For more information, contact:
World Cooperage
Barrels: **Ed Larmie, Yuri DeLeon, Jerry DeLorenzo, Gary Kroll**
Oak alternative specialist: **Paul Abbott**
2557 Napa Valley Corporate Dr., Ste. D
Napa, CA 94558
tel: 707-255-5900; fax: 707-255-5952
e-mail: info@worldcooperage.com
website: www.worldcooperage.com

PLEASE SEE WORLD COOPERAGE AD, PAGE 59, 124.

Santa Rosa Stainless Steel

Santa Rosa Stainless Steel (SRSS), one of the world's largest wine tank manufacturers, is in its 36th year of production.

SRSS builds tanks with capacities from one-gallon up to 700,000-gallon field-erected tanks. Each tank is finely crafted and passes through a rigid series of quality control checkpoints before shipment. Tanks are available on short notice from stock or may be custom-built to winery specifications.

Cooling jackets or panels can easily be added to existing tanks. SRSS press dimple jackets are quick to install in the field for retrofit to existing non-jacketed tanks for increased efficiency.

Jobsite retrofitting and tank repair are a large part of SRSS's expertise. In 2001, SRSS released a state-of-the-art, automatic punch-down unit that is installed in the tank and operated by an air cylinder above of the tank. The automatic control system is manufactured by Green Controls of Cloverdale, CA. Five units were installed and operating at Carneros Creek Winery for the 2001 crush.

SRSS can design and build tanks for micro-oxygenation. SRSS can also convert existing tanks for micro-oxygenation.

For more information contact:
Santa Rosa Stainless Steel
1400 Airport Blvd., Santa Rosa, CA 95403
tel: 707/544-7777; fax: 707/544-6316
e-mail: rod@srss.com
website: www.srss.com

PLEASE SEE SRSS AD, PAGE 43.

Westfalia Separator, Inc.

Count on Westfalia Separator, Inc., to help you squeeze every drop of potential from vineyards.

Westfalia is a leading manufacturer of high-performance centrifuges and systems for the wine industry. A member of the Separator Division of GEA, Westfalia is uniquely positioned to provide innovative solutions that meet your separation requirements.

Westfalia offers state-of-the-art, ready-to-connect separators and decanters for numerous processes useful to the wine industry including:

- wine clarification and polishing,
- wine recovery from lees,
- pre-clarification of lees,
- must clarification (including from a screw press and with combined flotation),
- highly efficient yeast removal,
- thickening of fining trub,
- thickening of lees from must tanks.

Conventional cooling processes can take a week to a month to separate tartrates. Westfalia's specially developed process for tartrate stabilization utilizes contact tartrate and can do the job in hours, allowing for fast production of ready-to-sell wines.

Westfalia also provides environmentally friendly disposal of yeast, separator, and fining trub.

With Westfalia Separator, customers "take the best — separate the rest."

For more information, contact:
Westfalia Separator, Inc.
100 Fairway Ct., Northvale, NJ 07647
tel: 201/767-3900
e-mail: salesinfo@wsus.com
website: www.wsus.com

Knox Industries

Mel Knox represents some of the best cooperages in the world, including Tonnellerie Taransaud and Tonnellerie Freres.

Tonnellerie Taransaud (Merpins, France) supplies many kinds of barrels to the greatest wine estates in the world. The Taransaud secret is twofold: excellent stock of naturally air-dried wood (all age-certified by Bureau Veritas) and great attention to detail. For example, Taransaud uses a thermocouple to measure the temperature of barrels when toasting. Time and temperature are closely monitored, so there are no surprises.

Besides making 225-liter barrels, Taransaud offers 350-liter, 400-liter, and 500-liter barrels, plus tanks, round casks, and ovals.

In 2000, Taransaud installed 56 oak tanks at Robert Mondavi Winery and eight special tanks at Harlan Estate, both in Napa Valley. These tanks have stainless steel tops with a removable inner cap and are ideal for fermentation and/or storage.

Tonnellerie Francois Freres is respected for its work with the top domaines of Burgundy, California, and the world. Both Burgundy and Bordeaux-shaped barrels are available.

The Francois Freres group acquired 50% interest in Trust International, a producer of Hungarian oak barrels. As the species of oak found in Hungary are the same as those found in France, barrels resulting from this alliance should be of interest to winemakers.

For more information, contact:
Knox Industries
Mel Knox
505 29th Ave., San Francisco, CA 94121
tel: 415/751-6306; fax: 415/221-5873
e-mail: icilabas@pacbell.net

PLEASE SEE KNOX INDUSTRIES AD, PAGE 53.

Lloyd W. Aubry Co., Inc.

The Lloyd W. Aubry Co., incorporated in 1962, has specialized in design, fabrication, installation, and modification of equipment, machinery, material-handling systems, and related structural and piping work for the beverage industry for more than 40 years.

Successful completion of more than 9,600 projects has provided valuable knowledge, expertise, and experience to meet every customer's need, regardless of work scope and schedule requirements. Lloyd Aubry Co.'s field and management personnel take pride in their problem-solving abilities, quality of work, character, and aptitude for providing a safe, accident-free workplace.

In the last several years, Lloyd Aubry Co. has performed more than 250,000 manhours with an exceptional safety record. During this time period, its worker's compensation experience modification factor has averaged between 0.60 and 0.82.

Lloyd Aubry Co. builds and installs complete grape handling systems and bottling lines. The company works with both large and small wineries to produce results that reflect excitement, energy, and expertise.

With annual sales of $20 to $25 million, the Lloyd Aubry Co. is large enough to handle the most demanding projects and schedule requirements yet small enough to offer each customer the personal attention necessary to ensure a successful result.

Lloyd Aubry Co. maintains a full-line fabrication shop in Hayward, CA, and satellite operations in White City, OR, and Little Rock, AR.

For more information, contact:
Lloyd W. Aubry Co., Inc.
2148 Dunn Rd., Hayward, CA 94545
tel: 510/732-9038; fax: 510/732-3137
e-mail: robert@lloydaubry.com

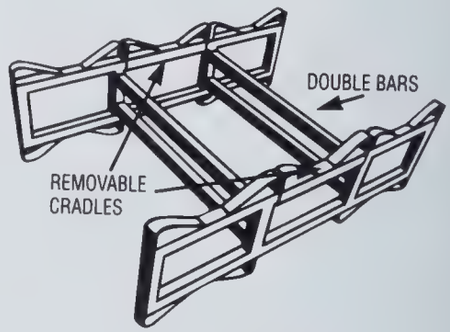
Western Square Industries

Western Square is the wine industry's largest supplier of portable steel barrel racks including stainless steel racks in two popular models, the double-inside bar (7-inch forklift opening) two-barrel rack and corresponding four-barrel rack.

Offered in powder-coated mild steel are the above two models plus a low profile (4-inch forklift opening) inside bar rack, so it is also a topping rack and a rack for the bottom tier of barrels, which can be pallet-jacked from any direction.

These standard models will accommodate all barrels from 200L to 275L. Special models are available. Regardless of which racks are used in your winery, Western Square can supply racks that will co-stack.

For wineries stacking barrels in pyramids, Western Square offers a cradle that replaces four chock blocks, thereby facilitating stacking.



Western Square offers two handy devices for holding a single barrel above two-barrel racks, useful when you have an odd number of barrels in a lot. One is the previously mentioned pyramid cradle, and the other is a removable center cradle (see photo with standard two-barrel rack).

Western Square offers a barrel-washing system specifically for use with portable racks.

For more information, contact:
Western Square Industries
1621 N. Broadway, Stockton, CA 95205
tel: 209/944-0921; fax: 209/944-0934
e-mail: info@westernsquare.com
website: www.westernsquare.com

Hansel Leasing, Inc.

Hansel Leasing, a full-service leasing company, has provided vehicle and equipment leasing for more than 40 years. Clients know with Hansel Leasing, each lease is customized to suit their specific needs.

HANSEL LEASING

We Lease Everything!

Hansel Leasing knows the wine business. Stephen E. Hansel, president of Hansel Leasing, is owner/winemaker of Walter Hansel Winery in Santa Rosa, CA. His hands-on experience and knowledge have been instrumental in making the company what it is today — a leading leasing resource for the wine industry.

As a direct lender, Hansel Leasing's professionals are able to make credit decisions, create documents, and pay vendors in a timely manner. The staff's goal is to make every transaction simple and convenient for clients and their suppliers.

Hansel Leasing can provide lease-financing for your winery. The portfolio includes leases for: crushers, presses, bottling lines, stainless steel tanks, oak wine barrels, refrigeration systems, barrel racks, vineyard wind machines, sorting tables, forklifts, tractors, seeders, and sprayers.

Need to lease something not on the list? Contact Hansel Leasing and see what the company can do.

"When you lease with Hansel Leasing, you are working with the very best."

For more information, contact:
Hansel Leasing, Inc.
Jim Taylor, Lease Manager
PO Box 3437, Santa Rosa, CA 95402
tel: 707/544-2822; fax: 707/578-8306

Scott Laboratories

Scott Laboratories introduces new MBF bottling equipment featuring plug-and-play technology, modular machines, and fully programmable electronic machines without mechanical cams in 2004.

Due to renewed interest in screw-top closures, MBF manufactures a complete range of capping machines for any type of bottle finish. The machines are made entirely from stainless steel, including a sloping base that prevents standing liquid. A wide choice of cap orientations, distribution systems, cap-removal systems, closing heads, and bottle-handling and positioning systems make these some of the most versatile capping machines available. They can handle any bottle type, cap configuration, and line speed.

Scott offers Dove insulation systems for retrofitting winery tanks. This economical, attractive insulation is installed quickly without scaffolding or interruption to production. Its efficiency is proven by years of use in Australia.

For more information, contact:
Scott Laboratories
2220 Pine View Way or PO Box 4559
Petaluma, CA 94955
tel: 707/765-6666; fax: 707/765-6674
e-mail: info@scottlab.com
website: www.scottlab.com

PLEASE SEE SCOTT LABORATORIES AD, PAGE 13.

TW Boswell

Experienced master coopers developed the TW Boswell collection, which includes the Legacy, Côte d'Or, and Médoc barrels. Each has a distinct personality built for distinct, reserve wines. Researchers have recently prepared sensory profiles for each barrel.

T.W. Boswell

For something more on the bashful side, the Côte d'Or provides traditional Burgundian toastiness, while encouraging fruit expression.

If you're looking for the expressive type, the Médoc barrel is made for more concentrated wines that suggest aging.

The charmer is the Legacy barrel that adds texture and maintains a proper balance of fruit and oak — with finesse.

Different toasting regimes used for the three distinct barrels are now monitored and repeated for exact consistency in quality. TW Boswell can provide product-profile sheets that show how the barrels are toasted and what winemakers can expect in terms of chemical and sensory attributes. These barrels provide old-world nuances with new-world consistency.

Côte d'Or and Médoc barrels have a 59-gallon capacity and are crafted of premium French oak. Médoc barrels are built from 30-month, air-seasoned oak. Legacy barrels have several options: standard or extra-fine grain, 59- or 65-gallon, 24- or 30-month air-dried oak, and are available in American, French, hybrid, or eastern European oak.

For more information, contact:
TW Boswell
Yuri DeLeon, Jerry DeLorenzo, Gary Kroll
2557 Napa Valley Corporate Dr. Suite D
Napa, CA 94558
tel: 707/255-5900; fax: 707/255-5952
e-mail: info@twboswell.com
website: www.twboswell.com

PLEASE SEE TW BOSWELL AD, PAGE 7.

Nadalie USA

Established in 1980 and formerly known as Tonnellerie Francaise, Nadalie USA was the first French cooperage in the U.S. to produce American oak wine barrels, crafting them in the classic French-traditional style and tailored to enhance unique qualities American oak brings to great wines.

In addition to barrels produced in Calistoga, CA, Nadalie offers French oak barrels from a variety of forests, coopered at the Nadalie Bordeaux and Marsannay Burgundy cooperages. Nadalie also imports *Intermedio*, an assemblage of woods from central and eastern Europe. Barrels from 110L to 500L are available and toasted to customer specifications.

Nadalie *add-in* oak products include tank and barrel inserts and systems, as well as chips.

NADALIE
USA

Aurelia Rivier leads the *add-in* oak division of Nadalie. Tom Cottrell represents Nadalie on the East Coast. Chris Paterson focuses on Napa County and the Pacific Northwest. Mo Kapur concentrates on Sonoma County, the Central Coast, and the southwest U.S.

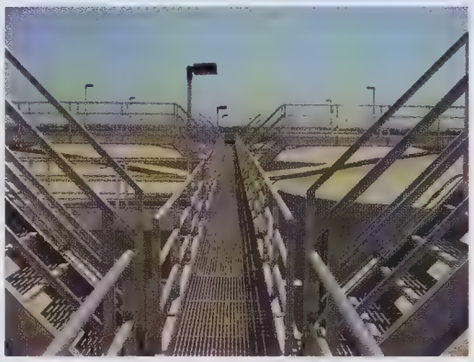
Nadalie USA maintains high consistency and quality of product, attention to customer specifications, and a common desire for perfection.

For more information, contact:
Nadalie USA
Duane Wall, Alain Poisson, Chris Paterson, Mo Kapur, Aurelia Rivier, Tom Cottrell
1401 Tubbs Ln., Calistoga, CA 94515
tel: 707/942-9301; fax: 707/942-5037
e-mail: nadalie@napanet.net

PLEASE SEE NADALIE USA AD, PAGE 31.

Ogletree's, Inc.

For 57 years, Ogletree's has specialized in custom fabrication of winemaking equipment. By relying on the continual pursuit of innovation and the company's historical stability, Ogletree's is able to optimize value and quality to satisfy the wine industry's needs, while providing customers with the security that the job will be done right the first time.



Ogletree's manufactures high-quality hoists, receiving hoppers, belt and screw conveyors, sorting systems, transfer lines, catwalk systems, and more. Ogletree's provides maintenance on all equipment offered.

Ogletree's years of service to the wine industry serve as a foundation to its design team. The team designs a superior product by collecting input from clients and focusing on their specific needs. By utilizing solid quality-control procedures and a precise six-point inspection, Ogletree's team of experienced fabricators delivers products second to none.

Since 1946, Ogletree's has proven to be a valuable asset to wineries, offering innovative solutions to help winemakers distinguish their wines in a competitive marketplace. The company's commitment has never changed. Ogletree's provides high-quality fabrication to customers with excellent value and on-time delivery.

For more information, contact:
Ogletree's
935 Vintage Ave., St. Helena, CA 94574
tel: 707/963-3537; fax: 707/963-8217
e-mail: rono@ogletreecorp.com

PLEASE SEE OGLETREE'S AD, PAGE 39.

Acrolon Technologies

TankNET® may be one of the most empowering new products introduced into wineries in many years. TankNET provides winemakers with instantaneous, anytime- and anywhere-access to critical fermentation data (Brix, temperature, pump-overs.) It gives winemakers control of tank fermentation like never before, enabling them to practice their craft with better and more complete knowledge of each lot.

The TankNET system provides precise wine-temperature control, while facilitating the reporting of critical fermentation data. Using a tank-affixed controller, cellar crews enter Brix measurements and pump-over events directly at the tank. Information can be instantly viewed, plotted, and analyzed in columnar or graphic form via the web — saving time and increasing control.

TankNET is flexible and robust, featuring:

- 24/7 accessibility via browsers — including PDAs,
- Brix, temperature, and pump-over tracking by lot code,
- animated cellar maps,
- real-time data logging, trending, and archiving,
- instantaneous alarms via cell phones or email,
- compatibility with The Winemaker's Database®.

New additions to the TankNET system include: a Brix Probe reader, a pump-control expansion module, and the patent-pending Strati-Probe™ — a deep temperature-monitoring device providing up to eight simultaneous sensor readings.

For more information contact:
Acrolon Technologies, Inc.
19229 Sonoma Hwy., Sonoma, CA 95476
tel: 707/938-1300; fax: 707/938-1342
website: www.acrolon.com

PLEASE SEE TANKNET AD, PAGE 105.

Pall Corporation

Bacteria and yeast can turn good wine bad. The process of keeping bacteria and yeast out of the bottle without affecting the delicate taste or color of wine is a constant challenge. New technology from Pall Corporation solves this universal vintners' dilemma. The Pall OenoPure™ filter removes organisms that can adversely affect wine quality and shelf life without altering color or taste.

The OenoPure filter effectively removes harmful contaminants during the critical filtration step before bottling. At the heart of the filter is a proprietary inert membrane that minimizes interaction with the wine, preserving the characteristics of flavor and color. This is critical, especially for premium brand wines.

The characteristics of the OenoPure filter — reliable microbial control, durability, and inert nature — provide wineries with an efficient and economical solution to wine filtration.

Pall's proprietary Polyethersulfone filtration membrane is formed into a high surface area cartridge with Pall's Ultipleat® technology. This award-winning technology results in a highly efficient and mechanically strong filter. The filter can be sanitized with most currently-used methods, including hot water, steam, or chemicals.

For more information, contact:
Pall Corp. Western U.S.
Allen Posella, System Specialist Manager
2336 Tenth St., Sanger, CA 93657
tel: 559/287-4061
Pall Corp. North America
Nicole Madrid, Sales Manager
2200 Northern Blvd., East Hills, NY 11548
tel: 516/810-9482

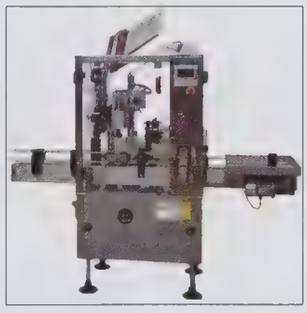
Criveller Company

Criveller Company is proud to announce that 2004 marks its 25th anniversary as a supplier of equipment to the wine and beverage industries!

Criveller's California office in Windsor, CA, is in place to expedite customer service for wineries in California, Oregon, and surrounding western states.

Criveller carries a wide variety of processing equipment for every winemaking phase and fabricates stainless steel tanks to customer specifications. A new line of red fermenters with a mobile plunger is available.

In conjunction with leading manufacturers of bottling and labeling equipment, Criveller offers manual, semi-automatic, or fully-automatic bottling lines, including cost-effective monoblocs and triblocs that cater to all your bottling needs.



Criveller's warehouses in Niagara Falls, Canada, and Windsor, CA, have various models of bottling equipment, filter equipment, destemmer/crushers, presses, and stainless steel tanks, including variable capacity and stock mini-tanks, available for viewing.

For more information, contact:
Criveller California Corp.
Rose Marie Galante
10350 Old Redwood Hwy.
Windsor, CA 95472
tel: 707/838-2222; fax: 707/838-2242
e-mail: crivca@sonic.net
Canada
Bruno or **Mario Criveller**
6935 Oakwood Dr.
Niagara Falls, ONT L2E 6S5
tel: 905/357-2930; fax: 905/374-2930
e-mail: info@criveller.com
East Coast
P.M.B. 202, 1623 Military Rd.,
Niagara Falls, NY 14304-1745
tel: 905/358-5202

PLEASE SEE CRIVELLER COMPANY AD, PAGE 64.

StaVin Incorporated

StaVin designs versatile and cost-effective Oak Integration Systems, using French, Hungarian, or American oak naturally seasoned for three years and available in three toast levels. To ensure thorough heat penetration and complex flavors, all oak is traditionally fire-toasted.

StaVin's website, www.microox.com,

discusses how using its oak and a micro-oxygenation system in tanks replicates the benefits of winemaking in barrels. Also, read how StaVin's Oak Beans and Segments effectively cross-link grape tannins to build mid-palate structure and stabilize color in red wine fermentation.

Packaged in food-grade, FDA-approved nylon bags, StaVin's French, Hungarian, and American Oak Beans (10-lb and 20-lb bags), and French Oak Stave Segments (15-lb bag) are convenient systems for imparting oak flavors within tanks.

StaVin's 44 sq.ft. Oak Stave Packs deliver quality oak at less cost than new barrels via three tank configurations: the Tank Modular System, Tank Matrix, and its newest system — the Tank Stave Fan.

To impart neutral barrels with the complexity and quality of new oak barrels, use StaVin's Oak Barrel Replica, Traditional Barrel Insert (now available in a new barrel extraction level), or Infusion Tube.

StaVin is also the U.S. marketing agent for Tonnellerie Berthomieu and Bernard's French oak barrels.

For more information, contact:
StaVin Incorporated
Alan Sullivan, Steve Sullivan, Dr. Jeff McCord, Jamie Zank
PO Box 1693, Sausalito, CA 94966-1693
tel: 415/331-7849; fax: 415/331-0516
e-mail: info@stavin.com
website: www.stavin.com

PLEASE SEE STAVIN AD, PAGE 62.

Mendocino Cooperage

Mendocino Cooperage believes that great American oak barrels are born in healthy, sustainable American oak forests. Since inception, the cooperage has pioneered the role of American oak in premium winemaking beginning with deep respect for (and knowledge of) American forest *terroir*.

AMERICA'S PREMIER COOPERAGE
MENDOCINO™

Mendocino Cooperage's own oak research team (unique to the industry) is focused on understanding and nurturing regional qualities and distinct oak profiles of U.S. forests. The quest to deliver superior and consistent sensory experiences begins with sophisticated forest assessment and selection combined with a commitment to forest sustainability to profile "a sense of place" Mendocino Cooperage believes is essential to the art of winemaking.

After careful selection and thorough seasoning, American oak is delivered to Mendocino's state-of-the-art cooperage in California. There, a dedicated team of artisans in North America's only ISO 9001:2000-certified cooperage ensures barrel characteristics are both unique and predictable from barrel to barrel, year after year.

Mendocino Cooperage — "Where the forest still matters."

For more information, contact:
Mendocino Cooperage
12901 East Side Rd., Hopland, CA 95449
tel: 888-340-2244 or 707/744-7425

PLEASE SEE MENDOCINO COOPERAGE AD, PAGE 11.

Mee Industries, Inc.

Mee Industries Inc. is a high-technology corporation with a history of providing innovative, cost-effective fog solutions for a wide variety of applications. In 1969, Thomas Mee Jr., a former Cornell University research scientist, founded the company. There is no substitute for experience. Mee Industries has over 33 years of experience developing fog systems for wineries.

Wine humidification needs of wineries come first and MeeFog™ systems deliver unparalleled results based on experience, expertise, and custom engineering for your humidification fogging needs. By maintaining a precise relative humidity set point in wine barrel rooms, MeeFog™ systems give the cellarmaster the ability to control water loss and alcohol content in the barrel cellar.

MEE INDUSTRIES INC.

Mee Industries' turn-key solutions include carefully engineered, high-quality, integrated packages delivering an outstanding combination of price and performance. An active research and development group guarantees that Mee Industries maintains its excellent reputation and technology lead.

Discover the MeeFog™ difference: energy-efficient, low maintenance, maintain high humidity without wetting, and reduce topping costs. Call 800/732-5364 for more information or visit www.meefog.com. MeeFog™ is the cellarmaster's system of choice.

For more information, contact:
Mee Industries, Inc.
204 W. Pomona Ave., Monrovia, CA 91016
tel: 626/359-4550; fax: 626/359-4660
e-mail: info@meefog.com
website: www.meefog.com

PLEASE SEE MEE INDUSTRIES AD, PAGE 37.

Carlsen & Associates

Carlsen & Associates designs, manufactures, and represents equipment for many aspects of the wine industry including:

- Receiving hoppers,
- Puleo stemmer/crushers,
- Waukesha must pump systems,
- Puleo open-screen membrane presses and closed tank presses,
- Waukesha centrifugal pumps,
- Yamada air pumps,
- Pump-over sumps,
- Pump-over devices,
- Ozone sanitation systems,
- Valves and fittings.

Carlsen & Associates produces quality products and services that provide simple solutions to your needs.

For more information, contact:
Carlsen & Associates
1439 Grove St., Healdsburg, CA 95448
tel: 707/431-2000; fax: 707/431-2005
website: www.carlsenassociates.com

PLEASE SEE CARLSEN & ASSOCIATES AD, PAGE 5.

Electro-Steam Generator Corp.

Electro-Steam Generator Corp. has manufactured all-electric steam generators since 1952.

The generators operate at 98% efficiency and produce culinary-grade steam. They are designed for point-of-use placement or with portable mounting. Some of the many uses include: sterilizing bottling lines, melting tartrates, refurbishing barrels, and general cleaning.

Because there is no open flame, Electro-Steam generators are safe to operate, resulting in lower insurance costs.

Basic maintenance will extend the life of an Electro-Steam unit by many years.

Each generator is hand-built to meet your requirements. The units are manufactured under the ASME Code, are national board of PVI shop-inspected, and UL- and ETL-certified. CSA certification is provided upon request.

For more information, contact:
Electro-Steam Generator Corp.
1000 Bernard St., Alexandria, VA 22314
tel: 800/634-8177; fax: 888/783-2624
e-mail: jharlin@electrosteam.com
website: www.electrosteam.com

PLEASE SEE ELECTRO-STEAM AD, PAGE 00.

Kelvin Cooperage

Kelvin Cooperage offers premium American oak wine barrels in all styles and sizes, including Bordeaux and Burgundy. All oak is air-dried for no less than 24 months and exposed to Kentucky's climate, ideal for seasoning oak.

Kelvin Cooperage has been family-owned and operated since founding in 1963. Utmost care is taken at every stage of the process, from oak selection to final testing of barrels, to ensure that you will receive the best barrels possible.

Ken Seymour has joined Kelvin Cooperage as sales manager. Ken's commitment to quality and service and his proven track record make him an excellent addition. Ken will handle marketing and service for Kelvin Cooperage's American oak wine barrels in the U.S. and Canada, with an emphasis on California, Oregon, and Washington.

For more information, contact:
Kelvin Cooperage
Ken Seymour, Sales Manager
2320 Creekside Rd., Santa Rosa, CA 95405
tel: 707/526-7567; cell: 707/280-5500
fax: 707/578-5589
e-mail: ken@kelvincooperage.com
website: www.kelvincooperage.com

KLR Machines, Inc.

KLR Machines is known throughout the wine industry for selling the Bucher series of membrane presses and Delta destemmer/crushers. These products have proven the reliability of the superb design and engineering capabilities of Vaslin-Bucher.

KLR introduces the following new equipment:

- JLB 12- and 20-HL basket presses (first seen in the 2002 harvest season) offer winemakers an innovative method to press high-end red pomace.
- The E-1, a new Delta destemmer, processes one to five tons-per-hour, is ideal for applications in which winemakers wish to slow down and optimize the selection process, and produce high-quality destemmed fruit.

- Mercier-Sanchez vibrating and belt tables and incline belt conveyors (introduced to the U.S. in 2002) are offered in several sizes to meet any sorting or transfer requirement. Variable speed controls are standard with Mercier-Sanchez equipment, placing winemakers in control of the selection process.

To inspect these new equipment offerings, please visit KLR Machines in booth M2 at Unified Symposium in January 2004.

For more information, contact:
KLR Machines, Inc.
350 Morris St., Ste. E, Sebastopol, CA 95472
tel: 707/823-2883; fax: 707/823-6954
e-mail: klrmach@pacbell.net

PLEASE SEE KLR MACHINES AD, PAGE 69.

Mistral Barrels

Mistral Barrels is developing a new technology in barrel toasting. The process is a unique enhancement that guarantees toasting conditions that are repeatable to obtain homogeneity in barrels produced. The technology directs the toasting profile to meet the specific characteristics required for a wine or enological style.

The process is controlled and monitored by sophisticated software that retains all aromatic and volatile compounds of the wood and achieves the temperature thresholds at which those compounds are liberated.

All toasting cycles take place hermetically, resulting in 100% clean production with no combustion, smoke, or external gases contaminating the wood.

The new system never surpasses the programmed temperature, preventing carbonization that occurs when wood is exposed to temperatures above 800°C (common with traditional toasting due to wood combustion). This is the only process available that is free of visible or invisible carbonization. A higher penetration of the thermal change in the wood is obtained, without deteriorating the surface.

The technology is currently being applied to American and French oak barrels and tested in 30 wineries located in France, Italy, Chile, Argentina, and the U.S.

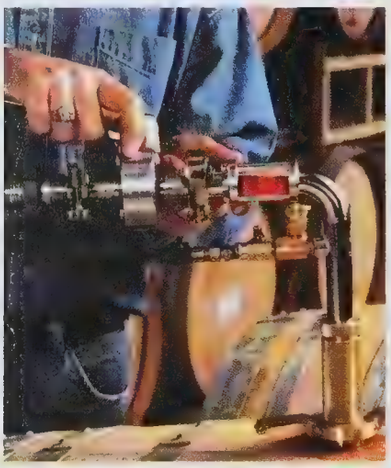
Mistral Barrels plans to present the advantages of this new technology to the international enological world in mid-2004. To meet this demand, the company has produced a limited stock of barrels available for distribution to clients upon request.

For more information, contact:
Mistral Barrels, Inc.
Pedro Teixeira
tel: 707/265-7900; fax: 707/265-7715
e-mail: pteixeira@mistralbarrels.com
website: www.mistralbarrels.com

Bulldog Manufacturing

Bulldog Pup gas pressure racking wand

Transferring wine with the Bulldog Pup gas-pressure racking wand allows easily-controlled gentle flow without agitation or oxidation. This convenient tool is indispensable for achieving extremely clean rackings. The Pup has become a valuable racking device for the cellar. The "Pup" racking process is often referred to as "Bulldoggin'" throughout the industry.



The Pup and attachments are constructed using top-quality material and craftsmanship. The Pup is very durable and has a sanitary design that is easily cleaned. The wand has nine inches of vertical height adjustment and can be locked in place at a desired height. An expanding silicone bung seals the wand in the barrel without damage and prevents gas leakage.

Optional attachments are available to add to the versatility of the Pup:

- The **Foot Valve** is a check-ball valve for the wine inlet to prevent wine from siphoning out when removing the wand from a barrel.
- The **Flex Leg** allows insertion into barrels with limited access.
- The new **Top Dog** secures the Pup in beer kegs for topping or racking.

"Don't settle for a mutt!"

For more information, contact:
Bulldog Manufacturing
PO Box 356, San Luis Obispo, CA 93406
tel: 805/541-3083; fax: 805/544-6181
e-mail: pups@bulldogmfg.com
website: www.bulldogmfg.com

PLEASE SEE BULLDOG MANUFACTURING AD, PAGE 40.

Mercier U.S.A., Inc.

Tonnellerie Mercier has acheived all the necessary changes after Frederic Mercier took over the small family cooperage. New buildings and modern machinery are dedicated to excellence and continuity of production.

From forest selection to your cellar, quality control is a priority. Each barrel is coded to certify wood, air-drying time, and all manufacturing details.

Master cooper Frederic Mercier uses oak obtained exclusively from French forests proven to be consistent, continuous sources of premium oak. Available barrels include: 225L export Bordeaux, 225L export Bordeaux thin stave (22mm), 225L Tradition Bordeaux/Burgundy, 225L Chateau Bordeaux Ferre, 228L Burgundy, and 500L puncheon.

Tonnellerie Mercier's team of experienced winemakers follow up by tasting and coordinating with clients around the wine world and provide experience and knowledgeable help to tune-up and respect your choices.

Troncais oak, aged for 36 months, is available for your finest red wines. Before your next order, call Tonnellerie Mercier, who will help you, glass in hand, in the cellar.

For more information, contact:
Mercier U.S.A., Inc.
Krimo Souilah
2164 Monticello Rd., Napa, CA 94558
tel: 707/251-5818; fax: 707/251-5811
e-mail: mercierusa@aol.com
website: www.mercierusa.com

PLEASE SEE MERCIER USA AD, PAGE 89.

Toyota Material Handling

Toyota Material Handling, U.S.A., Inc. has raised the standards of the lift-truck industry with introduction of a new line of 7-Series 3-wheel electric lift trucks. A leading innovator in lift-truck engineering for more than 35 years, Toyota was the first major supplier in the U.S. to harness the power of AC (alternating current) technology, offering customers cleaner operation and superior energy efficiency with a revolutionary AC-drive system.

The next generation of Toyota's AC technology, the AC-power system, consists of both drive and lift AC motors. The result is a new line of lift trucks with up to 45% more power than predecessors and remarkable annual cost savings due to improved efficiency, operator labor costs, and reduced maintenance requirements. The AC power system provides a material-handling solution that improves productivity and energy efficiency while significantly reducing overall operational standard-maintenance costs.

Toyota's new 7FBEU Series 3-wheel electric elevates energy conservation to a new level. Each sub-system is specifically designed to either conserve or regenerate power, maximizing productivity between battery charges. Toyota's Active Mast Control system enhances lift-truck load stability, assuring safety in the workplace comes first and productivity a close second.

For more information, contact:
Toyota Material Handling
Stephen Andres
tel: 800/527-3746
e-mail: info@tmhnc.com
website: www.tmhnc.com

PLEASE SEE TOYOTA MATERIAL HANDLING AD, PAGE 73.

Refrigeration Technology, Inc.

Refrigeration Technology, Inc. (RTI) builds portable glycol chillers with optional heating in three sizes (2hp, 3hp, and 5hp) for small wineries.

RTI Construction is a new division that sells and installs STAR™ metal buildings for production and storage buildings.

RTI has completed construction of a new 20,000 sq.ft. facility in Middletown, CA, which is the company's world headquarters. A full 7,200 sq.ft. have been bonded for temperature-controlled, case-goods wine storage (competitively priced), ideal for long-term storage of small lots. The warehouse is designed to maintain 58° to 60°F year-round and is equipped with temperature and security alarms.

The cost of RTI's Super Stat control systems has been reduced. They are now PC-compatible and feature new graph- and data-download options. RTI can put customer's control systems on the web for worldwide access by authorized personnel.

For more information, contact:
Refrigeration Technology, Inc.
18815 S. Hwy. 29, PO Box 368,
Middletown, CA 95461
tel: 800/834-2232 (toll free) or 707/987-0500
fax: 707/987-4581
e-mail: sales@rti2000.com
website: www.rti2000.com

PLEASE SEE RTI AD, PAGE 67.

CUNO Filter Systems

CUNO is a world leader in the design, manufacturing, and marketing of a comprehensive line of filtration products and systems for separation, clarification, and final filtration of fine wine.

Innovative products in CUNO's long list for wine filtration includes the first non-asbestos filter sheet (Zeta Plus®), long-lasting membrane filters optimized for repetitive hot-water exposure (BevASSURE® II), and the first multi-zone membrane prefilter (LifeASSURE®).

CUNO's latest advancement is the introduction of the Zeta Plus Maximizer™ line of depth filter cartridges for wine clarification. CUNO created the original ZETA Plus cartridge to address many drawbacks of conventional sheet filtration, including wine leakage, labor costs, and high running costs. Zeta Plus cartridges are installed in a completely enclosed, sanitary filter housing eliminating wine loss and requiring as little as 15 minutes to change filters. The new Maximizer version of Zeta Plus incorporates a dual-layer media design offering built-in pre-filtration for difficult-to-filter wines, dramatically extending filter service life.

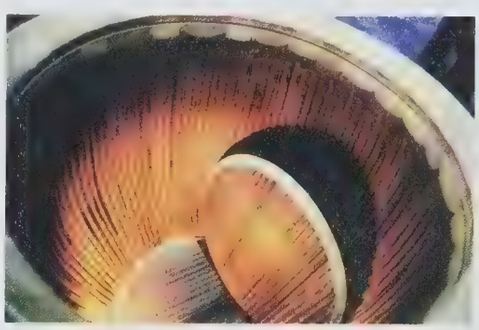
With over 90 years of experience and manufacturing facilities on five continents providing easy access to all major wine-producing regions, CUNO is uniquely positioned to serve wineries worldwide.

For more information, contact:
CUNO Filter Systems
400 Research Parkway, Meriden, CT 06450
tel: 800/243-6894; fax: 203/630-4530
e-mail: cohara@cuno.com
website: www.cuno.com

Seguin Moreau Napa Cooperage, Inc.

The taste of an exquisite wine is the result of a marriage of flavors between the grapes and the barrels that hold the wine during the ageing process.

Seguin Moreau's commitment to quality and consistency is a benchmark for the wine industry. This may explain why Seguin Moreau barrels are in winery cellars around the world. Seguin Moreau's dedication to innovation and research has resulted in a vast product line in American, French,



Russian, and European oaks.

Seguin Moreau is the only French cooper that buys 100% *haute futaie* (government-managed forests) for its French oak barrels. Its U-stave barrel is growing in popularity and is exclusive to Seguin Moreau. Available in American oak, this barrel provides a greater depth of toast, enhancing a wine with depth and elegance, providing a sweet, rich palate.

Seguin Moreau's proprietary Référence and Russian oak barrels were developed to add the same characteristics as French oak, offering clients another source of Quercus Sessilis, thus meeting the growing demand for quality oak. Seguin Moreau offers a barrel for every winemaking program.

Seguin Moreau blends prestigious French tradition, American resources, and dedication to clients to help make the best wines possible.

For more information, contact:
Seguin Moreau Napa Cooperage, Inc.
151 Camino Dorado, Napa, CA 94558
tel: 707/252-3408; fax: 707/252-0319
e-mail: jforster@seguinmoreau.com
website: www.seguinmoreau.com

PLEASE SEE SEGUIN MOREAU AD, PAGE 50.

Tonnellerie Saury

Harvest: subtle, fickle, unpredictable. It's all about confidence.

Every year, skillful winemakers rise to, relish even, the challenge of the unpredictable. Winemaking is, after all, a craft, a science, and an art form. A winemaker's individual style and the flair born of confidence combine to create wine that will be unique, yet still carry the unmistakable stamp of the vineyard and its creator.

If winemaking is all about confidence — it's all about control. The coopers at Tonnellerie Saury understand their craft and its importance to you. A barrel is a tool in your palette, and you choose a type of barrel as a perfect complement to your wines.

Tonnellerie Saury provides you with the option of either immersion-bent or fire-bent barrels, in French, American, and Eastern European oak — all tight-grain stave selections that are aged for 2½ years. Saury's rigorous standards provide you with a consistent tool to help you deal with the unpredictability of the vintage.

Let Tonnellerie Saury show you why so many winemakers use its barrels with confidence.

For more information, contact:
Tonnellerie de Correze, U.S.A.
Bayard Fox, U.S. representative
PO Box 672, Rutherford, CA. 94573
tel: 707/944-1330; fax: 707/944-1370
e-mail: info@sauryusa.com

PLEASE SEE TONNELLERIE SAURY AD, PAGE 38.

Gamajet Cleaning Systems, Inc.

Gamajet Cleaning Systems introduces the new Evacu-Blast barrel-cleaning system that combines water supply equipment with a new vacuum system to allow users to clean and empty barrels in place.

The Evacu-Blast is easily moved from barrel to barrel to clean and empty each barrel in less than two minutes without having to move or turn it. Each Evacu-Blast system includes a water pump with hoses and fittings, a Gamajet Barrel Blaster cleaning machine, a vacuum pump with hoses and fittings, and a custom-extractor wand. All equipment is housed in a portable cart for easy movement between barrels. The user simply needs to connect the system to a water supply.

The Evacu-Blast unit is offered as a complete system but is also available as a Gamavac, where only the vacuum equipment is installed for users who already have a water pump and Gamajet Barrel Blaster.

Gamajet is the only company providing an advanced, turn-key, barrel washing system. The Evacu-Blast continues Gamajet's cleaning innovations and maintains the company's focus on constantly improving the standards of barrel-cleaning technology.

For more information, contact:
Gamajet Cleaning Systems, Inc.
PO Box 626, Devault, PA 19432
tel: 610/408-9940; fax: 610/408-9945
e-mail: sales@gamajet.com
website: www.gamajet.com

PLEASE SEE GAMAJET AD, PAGE 30.

House Manufacturing Co.

House Manufacturing Company's Floating Brush Aerators provide a highly efficient way to mix and aerate wastewater.

The Floating Brush Aerator produces highly dissolved oxygen (per horsepower) with pumping rates over 3,800 gpm/hp (certified test data available). Unlike other wastewater aerators, House aerators are made with heavy, durable materials and fabricated in House's state-of-the-art, 99,000 sq.ft. manufacturing facility. You can rest easy knowing that you'll never have to worry about belts or untested mechanical designs when purchasing a House aerator.

The House aerator has proven to be effective on odor problems and algae/sludge reduction, and, due to its efficiency per horsepower, can reduce your costs.

The House aerators are available in 2-, 5-, 7.5-, 10-, 15-, 20-, and 25-hp models.

Contact House today to see what a difference the Floating Brush Aerator will make in your wastewater-treatment process. If you give House's aerators an ounce of maintenance, they will give you pounds of performance year after year.

For more information, contact:
House Manufacturing Co.
PO Box 117, Cherry Valley, AR 72324
tel: 870/588-3307; fax: 870/588-3517
e-mail: info@housemfg.com
website: www.housemfg.com

PLEASE SEE HOUSE MANUFACTURING AD, PAGE 49.

Demptos Napa Cooperage

You don't have to be an enological Rip Van Winkle to have missed the dramatic developments at Demptos! During 12 years of Francois family ownership, the Bordeaux cooperage was modernized and new cooperages were constructed in Napa, CA, Szigetvar, Hungary, and Logrono, Spain. Demptos Cooperages uses its oak selections to produce world-class French, American, and Hungarian oak barrels for some of the world's finest wines.

Demptos selects tight-grained American white oak from heavy clay and gravel soils within a 50-square-mile area in southern Missouri. Following natural seasoning for 27 months, the staves and headwood are sweet and ready for coopering into 228L Burgundy and 225L Bordeaux Export style barrels. Traditional oak-fire bending and toasting (minimum of 50 minutes) allow complete development of toasty, sweet oak flavors in the finished barrels.

Backed by the Demptos research department, Demptos coopers French and Hungarian oak barrels in Burgundy and Bordeaux styles and custom oak tanks. Ten forest selections and 12 barrel styles promise the best barrels to complement your wine.

Visit Demptos Napa Cooperage for a complete tour and barrel seminar. The staff, including Mark Heinemann, Coby Jamieson, Laura Juhasz, Tom Payette, and Will Jamieson, looks forward to working with you in 2004!

For more information, contact:
Demptos Napa Cooperage
1050 Soscol Ferry Rd., Napa, CA 94558
tel: 707/257-2628; fax: 707/257-1622
e-mail: info@demptosusa.com
website: www.demptosusa.com

PLEASE SEE DEMPTOS NAPA COOPERAGE AD, PAGE 48.

Logix

Winery automation has become the backbone of the wine industry, and Logix is an experienced controls manufacturer, committed to the wine industry.

Logix's TC-2000 electronic tank thermostats offer a flexible starting point in control systems. The TC-2000 provides stand-alone, single- or dual-stage cooling and/or heating control for wine tanks and is ETL-listed for industrial use.

Using Logix software, TC-2000 units can be networked to a PC with Logix software for central-point monitoring and control. All operating data and alarms are logged and available for plotting and reporting.

Each TC-2000 is PC-enabled, has two relay outputs with independent heating/cooling, is UL-listed for industrial control, and is designed for low-light conditions. TC-2000s feature high/low temperature alarming, Brix field entry, a dual temperature probe option, pump-over control/notification, keypad lockout, and a UL-listed, Type 4 washdown enclosure.

TC-2000 networks can be connected to a Logix Winery Control System for operation in coordination with compressors, chillers, air units, CO_2 monitoring/fresh air exchange, and more.

The TC-2000's optional features allow it to expand with a winery. These features include: internet and modem access; remote alarm notification; trend reports and plots; Microsoft Excel interface; computer network access; database integration; energy management; refrigeration-equipment control; CO_2 monitoring and control; fresh/night air exchange; humidity and barrel room control; and wastewater monitoring.

For more information, contact:
Logix: Jim Conant, Mike Ghan
10518 NE 68th St., Kirkland, WA 98034
tel: 425/828-4149; fax: 425/828-9682
e-mail: info@logix-controls.com
website: www.logix-controls.com

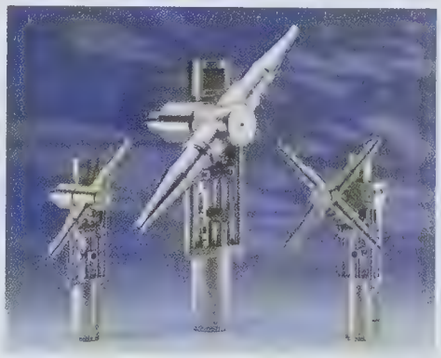
PLEASE SEE LOGIX AD, PAGE 88.

Chemdet, Inc.

Chemdet has supplied quality equipment to clean the interiors of open or closed, large or small containers and tanks for more than 30 years.

Turbodisc tank washers are designed to produce a dense spray pattern of heavy, impinging droplets and operate at low pressure. The only moving part is a rotating disc. Turbodisc washers are particle-tolerant and available in several sizes with either 180° or 360° spray patterns. Turbodiscs are ideal for applications where direct impingement from a nozzle jet is not required.

For more difficult cleaning jobs, Chemdet's Rotaballs offer powerful jets and multiple cleaning patterns. The wash fluid rotates the head at a steady pace to ensure maximum impact. Rotaballs have a simple drive mechanism that use no gears or ball bearings. A new model is designed specifically for barrel washing.



For the most difficult cleaning applications, Chemdet offers the Fury line of tank washers (pictured). Fury models provide concentrated, high-impact, rotating spray jets for cleaning large or heavily soiled tanks. A unique piston drive eliminates the need for high internal flow rates and reduces pressure losses. Low-pressure models operate at 10 to 80 PSI. The simple, yet powerful design provides efficient and reliable results with low maintenance costs.

For more information, contact:
Chemdet, Inc.
730 Commerce Center Dr., Ste D,
Sebastian, FL 32958
tel: 800/645-1510
e-mail: info@chemdet.com
website: www.chemdet.com

Canton Cooperage

Canton Cooperage's premium, American oak wine barrels are made from extended air-dried white oak, cut in Canton's own stave mills. After selecting the best and oldest wood, the cooperage blends the oaks to create a consistent product that customers worldwide have come to know and appreciate.

Today, Canton produces three high-quality American oak barrels that will meet any winemaker's needs.

- **Grand Cru** — High-quality American oak specially selected for the tightest grain from the best forests and naturally seasoned for 36 months.
- **Vintage** — High-quality American oak specially selected from the best forests and naturally seasoned for 24 months.
- **Classic** — The best selection of American oak specially selected from the best forests and naturally seasoned for 18 months.

Canton Cooperage has been part of the Chene & Cie Company since 1998. Chene & Cie's holdings include: barrel producers Taransaud, Jacques Garnier, Canton Cooperage, Xtraoak, and Thales.

Whether the goal is consistency, complexity, or something truly bold and assertive, Canton has the products and expertise to meet the most exacting requirements of today's winemakers.

For more information, contact:
Canton Cooperage
5793 Skylane Blvd. #B, Windsor, CA 95492
tel: 707/836-9742; fax: 707/836-9759
website: www.cantoncooperage.com

PLEASE SEE CANTON COOPERAGE AD, PAGE 88.

Vinovation, Inc.

Modern winemaking's first decade of awareness of oxygenation techniques required only stripped-down experimental prototypes. These have proven inadequate for serious full-plant installations, where pennies saved in investment can cost many dollars of inconvenience. Now OenoDev, pioneer in micro-ox investigation and a world leader in equipment sales, introduces the first fully-integrated professional INTER-Ox system for all your oxygenation needs.

INTER-Ox enables hyper-ox, macro-ox, micro-ox, clique-age, and sulfide treatment, all from one diffuser due to its 1200:1 turn-down capability in any size tank. An international design team combines centralized engineering with local design expertise to optimize your installation. Internet-based control panels display treatment history and enable adjustment and troubleshooting from any location, including your pocket PC.

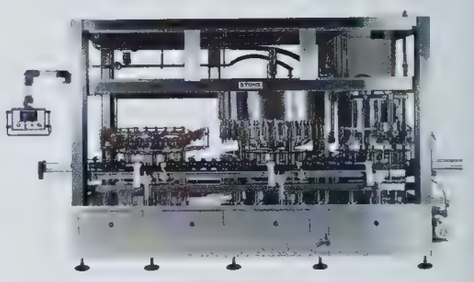
Features include: Boyles Law-based precision delivery, interactive linking to plant process control and analysis, easy economical expandability, alarms for power failure, temperature out-of-bounds, fouling, exhausted O_2 supply, plus built-in continuous bubble-point integrity testing. Turn-key installation and enological support packages are available.

Oxygenation is one of the best bargains of any winery investment. "It makes sense to install the best."

For more information, contact:
Vinovation, Inc.
1446 Industrial Ave., Sebastopol, CA 95472
tel: 707/824-7900; fax: 707/824-7905
e-mail: info@vinovation.com
website: www.vinovation.com.

Vintners Supply Company

Vintners Supply Company, a division of Moeckly Enterprises, Inc., now located in Santa Rosa, CA, is pleased to announce that it is the exclusive west coast representative for Stone bottling equipment.



Stone, located in Bourgoin, France, manufactures a complete line of bottle fillers, corkers, rinsers, and blowers including mono-block versions, foil spinners, washer-dryers, and portable, trailer-mounted bottling lines. Bottling speeds available are from 40 to 400 bottles per minute.

Vintners is now an authorized distributor for the Alconox, Inc., line of critical cleaning agents including *ALCONOX, TERG-A-ZYME, ALCO-JET,* and *CITRANOX.* All Aconox products are available from Vintners' Santa Rosa warehouse.

Vintners also represents: AB Enzymes, A. Sutter AG (grape presses), ABEL Pumps Corp., C.E. Bartlett in Australia (tank-press membranes), M.A.S. Keltereiservice in Germany, Candigra/Inoxpa of Spain (stainless steel valves and fittings, pumps, and mixers), Crosible (filter-press cloths), Dorr-Oliver EIMCO (recessed-plate and pre-coat filters), FILTROX AG (filter media and equipment), Krogh (pumps), and PTI Advanced Filtration, Inc. (micro-filtration products).

For more information, contact:
Vintners Supply Company
Robert Moeckly, Linda Moeckly
PO Box 153, St. Helena, CA 94574
3715 Santa Rosa Ave., #A-5
Santa Rosa, CA 95407
tel: 800/366-6809; fax: 707/584-7955
e-mail: Info@vintnerssupply.com
website: www.vintnerssupply.com

PLEASE SEE VINTNERS SUPPLY AD, PAGE 85.

The Boswell Company

The Boswell Company represents three specialized French oak barrel cooperages. These sensitive, mature coopers understand that winemakers prefer consistent barrels with personality.

Tonnellerie de Mercurey produces Burgundy barrels for Pinot Noir, Chardonnay, and Syrah. **Tonnellerie Jean-Louis Bossuet** makes French oak barrels primarily for Merlot and Cabernet Franc. **Tonnellerie Berger**, in the Medoc, creates Bordeaux barrels for Cabernet Sauvignon.

These coopers are fully committed to their craft and their classic workshops make wine barrels without rushing. French oak sourcing, stave selection, and ageing regimes are fully controlled and toasting processes are easily customized. Family management promotes consistency and accountability.

The Boswell Company introduces impeccable barrels from 36-month, air-dried Missouri oak coopered by Keith and Nathan Roberts. A master barrel guru, Keith Roberts has successfully created three major cooperages in California. His current American oak barrel production is based on a lifetime of work with oak sourcing, extended air-drying, and optimal toasting regimes.

The Boswell Company supplies innovative cellar tools, including silicone bungs, wine thieves, and sponge-rubber hose-cleaning balls to help winemakers maintain wine quality.

For more information, contact:
The Boswell Company
1000 Fourth St., Ste. 640
San Rafael, CA 94901
tel: 415/457-3955; fax: 415/457-0304
e-mail: staff@boswellcompany.com
website: www.boswellcompany.com

PLEASE SEE BOSWELL COMPANY AD, PAGE 25.

Fogmaster Corporation

Fogmaster's new Sentinel-5850 barrel-room humidification system brings innovative atomization technology to small- and medium-size wineries. It uses a turbulent-vortex nozzle to atomize water into micro-droplets that evaporate quickly and spread uniformly throughout the barrel room.

The control unit (pictured) monitors relative humidity and regulates water flow. A regenerative blower, designed for efficiency and low-maintenance cost, provides air to atomize water.

When humidity drops below the set point, the control unit activates the system and the nozzle ejects a fog of tiny droplets. The droplets evaporate quickly and raise humidity to keep barrels dry. Because the nozzle has no tiny orifices, nozzle plugging is not an issue.

Designed for "do-it-yourself" installation, the Sentinel-5850 includes all installation components except the two-inch PVC pipe needed to convey air from the blower to the nozzle.

A single nozzle system can maintain a 5,000-sq.ft. barrel room. A cart option is available for users requiring mobility.

For more information, contact:
The Fogmaster Corporation
1051 SW 30th Ave., Deerfield Beach, FL 33442
tel: 954/481-9975; fax: 954/480-8563
e-mail: info@fogmaster.com

PLEASE SEE FOGMASTER AD, PAGE 89.

Stokes Ladders, Inc.

A leading manufacturer of aluminum orchard ladders for more than 40 years, Stokes Ladders, Inc., offers quality rolling barrel-room ladders specifically designed to fit in narrow aisles between stacks of wine barrels. Now used in over 60 West Coast wineries, these ladders provide workers safe access to barrels without having to climb racks, and eliminate having to lower barrels with a forklift to be inspected or topped.

Ladders can accommodate stacks up to six barrels high. The height of the ladder, combined with a narrow 18-inch width, allow for maximum barrel count in a barrel room.

The ladders are constructed of high-strength, light-weight structural aluminum, and feature four heavy-duty, non-marking locking casters, a roomy 16-inch x 24-inch top platform with handrails and toe boards, 7½-inch deep steps, and a comfortable 60-degree climbing angle.

Options include a back ladder and different base configurations. Because of the narrow base, these ladders must only be used in the narrow confines of barrel aisles. Custom ladders are available.

For more information, contact:
Stokes Ladders, Inc.
PO Box 445, Kelseyville, CA 95451
tel: 707/279-4306 or 800/842-7775
fax: 707/279-2232
e-mail: info@stokesladders.com
website: www.stokesladders.com

PLEASE SEE STOKES LADDERS AD, PAGE 20.

Winetech

Winetech provides mobile filtration services and winemaking equipment and supplies.

Winetech's winemakers work with customers to achieve the highest wine quality by complementing its technology and expertise with the vision and goals of the customer.

The complete range of state-of-the-art mobile services includes:
- Lees filtration,
- VA adjustment,
- Crossflow filtration,
- DE pressure-leaf filtration,
- Brettanomyces treatment.

Winetech is proud to offer a complete line of equipment and products from manufacturers committed to enological research and development and to become a premier supplier of quality winemaking products and technologies to the wine industry.

Specialty equipment includes crush equipment, yeast rehydrators, concentrators, filters, micro-macro oxygenators, filterability test units, and electrodialysis.

Winetech is the exclusive distributor of patented and innovative winemaking solutions from Enologica Vason - Ju.Cla.S. Yeast, nutrients, enzymes, tannins, fining agents, additives, filtering media, and other basic materials are available.

Winetech can provide information and resources needed to choose the best winemaking technologies and supplies. Samples and literature are readily available for winemaking products. Winetech also conducts demonstrations and trials with equipment and instruments.

For more information, contact:
Winetech
125 Klamath Ct.
American Canyon, CA 94503
tel: 707/552-2080; fax: 707/552-2117
website: www.winetechllc.com

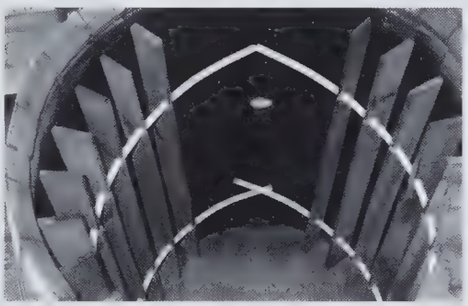
PLEASE SEE WINETECH AD, PAGE 84.

Innerstave, Inc.

Original ideas are few, and most are not effective tools to save time or money. Innerstave is the ***original*** barrel insert and has been used as an effective tool to add oak character to wines for 25 years. It saves money through lower costs for oak flavors.

Since 1979, Innerstave has gained wide acceptance in all forms of barrels and tanks because of its exclusive, non-invasive, cleanable design. Innerstave, designed for stainless steel tanks, requires no welding and is installed by the company's own qualified coopers.

Innerstave receives high acclaim for its award-winning, premium oak character that can be found in many highly-rated wines. An on-site supply of aged French and American oak ensures availability of prepared oak for every order, and gives winemakers control of oak type, wood-to-wine ratio, and toast level. Each is important when making award-winning wine.



Innerstave works closely with winemakers, so the choices of wood type and toast level match each wine. Innerstave design, manufacturing, and installation staff then carefully adheres to these decisions. All wineries purchasing from Innerstave are guaranteed satisfaction.

For more information, contact:
Innerstave, Inc.
Bob Rogers
24200 Arnold Dr., Sonoma, CA 95476
tel: 707/996-8781; fax: 707/996-1157
e-mail: bob@innerstave.com

PLEASE SEE INNERSTAVE'S AD, PAGE 15.

St. Patrick's of Texas

St. Patrick's began in 1991 in a two-bedroom house in California as a retail homebrew shop. Today, St. Patrick's supports small to midsize wineries from two warehouses in Austin, TX, and in spring 2004 will open a new warehouse in Sacramento, CA.

St. Patrick's stocks equipment for small to mid-size wineries including:
- Enoitalia crushers/destemmers,
- Marchisio stainless steel tanks,
- Cooling plates and coils,
- Tank manways and hatches,
- Membrane-, hydraulic-, water-, and ratchet-presses,
- French oak barrels,
- Enoitalia and Zambelli pumps,
- Plate filters and filter media,
- Filling machines,
- Pneumatic and electrical corkers,
- Norcor corks,
- Heat-shrink and foil applicators,
- Semi-automatic and manual labeling machines,
- Stainless steel fittings and valves,
- Wine hose and clamps.

For more information, contact:
St. Patrick's of Texas
1828 Fleischer Dr., Austin, TX 78728
tel: 512/989-9727; fax: 512/989-8982
e-mail: stpats@bga.com
website: www.stpats.com

PLEASE SEE ST. PATRICK'S AD, PAGE 32.

Tonnellerie Radoux U.S.A., Inc.

The skills of Tonnellerie Radoux's master coopers are crucial to selecting the finest *Haute Futaie*-grown oak from forests maintained for hundreds of years under strict French regulations. Only the tightest-grained oak is selected from the Center of France, Vosges, and central European areas, and American white oak from Missouri, Minnesota, and the Appalachian regions.

In 2004, French oak and American oak barrels, puncheons, chips, and stave-inserts are offered, and Tonnellerie Radoux will continue to create the oak fermentation and ageing tanks that were founder Robert Radoux's original focus.

Each barrel is produced to meet a wine's and winemaker's distinctive style and personalized service is reinforced by strict quality control to ensure consistency.

Just as the sun influences the maturity and flavor of grapes, the toasting process gives each barrel its aromatic qualities. Being accustomed to winemakers' styles and objectives is essential to achieve the appropriate balance between wine and wood.

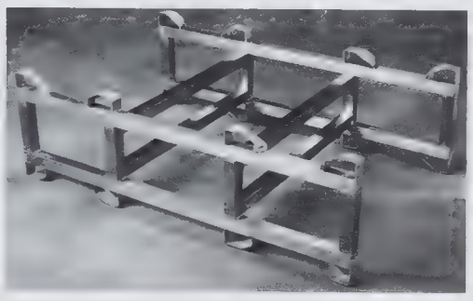
The cooper's art requires an expertise and skill handed down from generation to generation. At Tonnellerie Radoux, commitment and pride in its work are a deep-rooted tradition that is passed down through training programs that teach apprentices techniques that have withstood the *taste* of time.

For more information, contact:
Tonnellerie Radoux U.S.A., Inc.
480 Aviation Blvd., Santa Rosa, CA 95403
tel: 707/284-2888; fax: 707/284-2894
e-mail: pmichel@radoux-usa.com
website: www.tonnellerieradoux.com.

G.W. Kent, Inc.

G.W. Kent is a leading importer and distributor of commercial winery equipment and supplies. A complete line of winemaking equipment is offered, including variable capacity stainless steel tanks (available with or without cooling jackets).

The company has an assortment of stainless steel connections in virtually every size in stock, including tri-clamp, NPT, butterfly valves, ball valves, sight glasses, reducers, adaptors, gaskets, etc. Stainless steel barrel racks are in stock in Napa, CA, and in G.W. Kent's Michigan warehouse.



G.W. Kent is the eastern U.S. representative for Tonnellerie Vernou, stocking the cooperage's finely-crafted oak barrels in its Michigan warehouse. A large selection of upright, oval, and round tanks — made of premium-selected French oak and equipped with stainless steel doors and valves — is available from stock or custom production.

Items available for immediate delivery are: Goodyear winery hose, PVC capsules, Spadoni filters, and Seitz filter sheets. Presses, crushers, and destemmers are available in a range of sizes.

G.W. Kent prides itself on quick service, good products, and fair prices. A complete product catalog with photos and prices is available.

For more information, contact:
G.W. Kent, Inc.
3667 Morgan Rd., Ann Arbor, MI 48108
tel: 800/333-4288 or 734/572-1300
fax: 800/500-7505 or 734/572-0097
email: info@gwkent.com
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Tekanis, Inc.

Tekanis, Inc. engineers solutions to technically challenging winery problems. President/inventor Dave Soberanis has a wide-ranging and varied engineering background, allowing Tekanis to bring a new perspective, and new solutions, to difficult problems.

The new PomaceShovel safely, quickly, and gently removes grape pomace after fermentation. A single operator controls the PomaceShovel, monitoring its progress using a camera deployed through the top opening of the tank. The PomaceShovel enters the tank so that workers no longer need to. Using patent-pending technology, the PomaceShovel gently sweeps grape pomace from the tank into a waiting bin. The machine can remove pomace at more than 25 tons per hour.

Initial testing by ETS labs shows that press wine from pomace emptied with the PomaceShovel meets or exceeds the quality of press wine from hand-shoveled tanks.

POMACE SHOVEL

The PomaceShovel is portable and can be configured to fit tanks from six to 12 feet in diameter. It's easy to clean, and the hydraulic system is made with food-grade materials. The PomaceShovel is constructed of stainless steel, heavy-duty rated for continuous use, and available in 240/480-volt, three phase systems.

Gentle, safe, fast, and cost-saving, the PomaceShovel turns one of a winery's most bothersome and dangerous tasks into a one-person job.

Orders are being taken for the 2004 fermentation season.

For more information, contact:
Tekanis, Inc.
PO Box 628, Hopland, CA 95449
tel: 707/744-8954
e-mail: dsobes@pacific.net
website: www.tekanis.com

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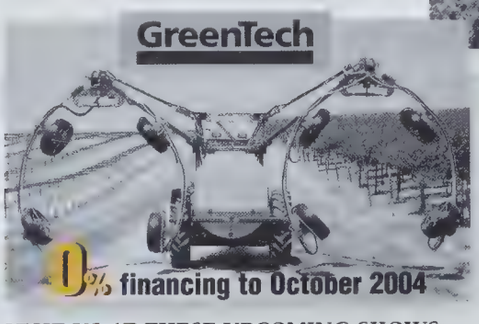
2200FS over row tractor with 7' 8" of crop clearance shown here with a 3 row GreenTech spray system.

GreenTech's combination fan/spray heads deliver a high volume of air, creating tremendous leaf turbulence.



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R. Smart/ M. Robinson
Quality assurance in vineyards, canopy management and economics, improvement of canopy microclimates, importance of winegrape canopies, construction of trellis systems. **88pp—$39.00**

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Peter May
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Tom Powers
Provides a clear outline with diagrams and color photos on how to build and maintain your own vineyard. **118pp—$19.95**

Viticulture, Vol. II, Practices in Australia
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Grapevine propagation, vineyard establishment, pruning, canopy management, irrigation, drainage and soil salinity, soil management and frost control; grapevine nutrition, grape pests, disease, protection.
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Julianne Poirier Locke
Sustainable winegrowing in Napa County including: erosion, water, weeds, soil, wildlife, cover crops, vine health, and organic farming.
181pp—$15.95

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John Gladstones
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Wine Analysis and Production
B. Zoecklein, K. Fugelsang, B. Gump, F. Nury
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Wine Growers Guide
Philip Wagner
Easy to understand essentials to establish a vineyard, pruning, training, vineyard management, propagating vines, and vine ailments. **240pp—$19.95**

Wine Microbiology
Kenneth Fugelsang
Provides background information, step-by-step laboratory procedures, and interpretation of results. **245pp—$79.95**

Winery Utilities Planning, Design, and Operation
David Storm
Describes each of the major components of winery utility systems for planning, design, and operation. **550pp—$105.00**

Winery Wastewater Handbook: Production, Impacts, and Management
Jeanette Chapman, Phillip Baker, Sabina Wills
Examines the chemical nature of wastewater, its impacts, how it can be handled efficiently, and disposed of responsibly. **128pp—$21.00**

Tonnellerie Bordelaise

Tonnellerie Bordelaise offers barrels of unique quality to wineries thanks to the extensive experience of its barrel-producing partners.

The company combines wood sourcing and milling by Scierie Delord (a third-generation wood mill business headed by Patrick Delord) with barrel-making by master cooper Didier Fesil, whose experience includes master cooper responsibilities at Sylvain and Chateau Smith Haut Lafitte in Pessac-Leognan, France.

This partnership allows Tonnellerie Bordelaise to trace and control every piece of wood, from specific forest source to finished barrel. All Bordeaux- and Burgundy-style barrels are made using the finest-grained sessile oak sourced only in oak forests of central France.

Prior to being fashioned into staves at the tonnellerie, selected shooks are moisture-controlled and air-dried for 24 to 36 months in the outdoor yards at Scierie Delord to ensure optimal seasoning of the wood.

Each order is custom-made to meet each customer's specifications. Master cooper Fesil personally oversees all barrel toasting, fabrication, and finishing in Tonnellerie Bordelaise's artisan workshop and inspects every barrel to assure quality.

Tonnellerie Bordelaise strongly believes in working closely with winery customers to anticipate their needs and help achieve the goal of creating elegant, fine wines.

For more information, contact:
Tonnellerie Bordelaise
Oliver E. Wood, Jr., Sole Agent
25227 Hatton Rd, Carmel, CA 93923
tel: 831/625-0304; fax: 831/625-0305
e-mail: owood@tonnelleriebordelaise.com
website: www.tonnellerie-bordelaise.com

PLEASE SEE TONNELLERIE BORDELAISE AD, PAGE 71.

RLS Equipment Co., Inc.

RLS Equipment Company, Inc., has provided wineries with quality equipment and service for more than 40 years. As agent for Kiesel, Magitec, Pera, Strassburger, and Moeschle, RLS can supply complete crushing and pressing facilities.

Kiesel progressive-cavity pumps are available in both hopper and in-line styles from 1,000 liters per hour to more than 200+ ton per hour (tph). The unique Kiesel "corrugated" tube-in-tube heat exchangers can process from hundreds to thousands of gallons per hour.

Pera membrane presses are available from 30hl to 480hl with touch-screen PLC controls. Pera's H-Series destemmer/crushers range from 4 tph to 100+ tph with a punched-hole basket design.

Moeschle cylindrical and rectangular stainless steel tanks are custom-designed for specific customer requirements.

Strassburger offers high-quality plate/frame, and lees filters. Stainless steel construction with either S/S or noryl plates are durable and easy to clean. A wide variety of filter pads is available.

Magitec destemmer/crushers are available from 2.5 tph to 60+ tph with Magitec's unique square-hole basket. Magitec now offers a variable-speed, double-driving system (basket/beater bar) on smaller units and split machines with vibrator-sorting tables between destemming and crushing operations.

RLS offers domestically-produced replacement membranes for most presses and a used equipment listing.

For more information, contact:
RLS Equipment Co., Inc.
1017 White Horse Pike, Egg Harbor, NJ 08215
tel: 609/965-0074 or
West Coast tel: 800/527-0197
fax: 609/965-2509
e-mail: rls.equip@worldnet.att.net
website: www.rlsequipment.com

PLEASE SEE RLS AD, PAGE 29.

Echo Supply

Echo Supply, a manufacturer of silicone bungs, introduces the Echo Easy-Seat fermentation bung with a one-piece, barrel-friendly design. This unique venting bung allows for outgassing during fermentation through side air channels and can be inserted and removed without the use of tools, preventing barrel damage.

A low-profile design allows the bung to seat flush against the barrel, reducing accidental knockouts. This one-piece bung is simple to use and easy to clean. Please contact Echo Supply for a free sample or demonstration.

Echo Supply's complete line of bungs is made from 100% food-grade silicone and can be molded in any color, size, or shape. The company's translucent bungs have no pigments or fillers to mask impurities and its colored silicone only uses enough pigment to produce the desired color. Echo Supply is capable of manufacturing custom bungs with company logos or designs.

A line of hand-held refractometers is also available. Information on all Echo Supply products is available on its website, www.echofermentation.com.

For quality bungs and customer service, Echo Supply is an excellent choice.

For more information or samples, contact:
Echo Supply
Mike Chew
1026 Hanson Ct., Milpitas, CA 95035
tel: 800/878-6924; fax: 408/945-0336
e-mail: info@echofermentation.com
website: www.echofermentation.com

Skolnik Industries, Inc.

Skolnik stainless steel cooperage is designed to meet the special needs of winemakers in all stages of fermentation, maturation, and storage of fine wines. Skolnik has a long and proud tradition of providing leading winemakers with stainless steel drums of high quality, durability, and design.

SKOLNIK INDUSTRIES, INC.
MANUFACTURERS OF STAINLESS STEEL BARRELS

Skolnik's wine industry customers look to stainless steel cooperage to supplement oak barrels in key stages of the winemaking process. Stainless steel offers unique and unsurpassed qualities for preserving product integrity and purity — important considerations for why stainless is a key tool for winemakers.

Stainless steel cooperage is:

- Versatile and adaptable to many uses,
- Ready for use after being sterilized,
- Cost-effective and long-lasting,
- Predictable, reusable, and easy-to-clean,
- Virtually maintenance-free,
- Available in sizes from 5 to 110 gallons.

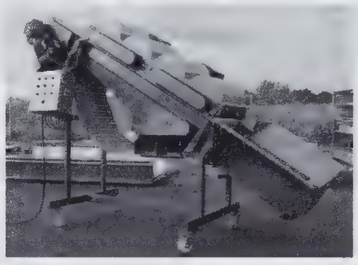
Skolnik is a full-service manufacturer of steel containers and accessories. Every Skolnik container is thicker, heavier, and stronger than industry standards — a commitment made to customers for more than 75 years.

For more information, contact:
Skolnik Industries, Inc.
Jason Snow
4900 S Kilborn Ave., Chicago, IL 60632
tel: 800/441-8780; fax: 773/735-7257
e-mail: jason@skolnik.com
website: www.skolnik.com

PLEASE SEE SKOLNIK INDUSTRIES AD, PAGE 78.

Euro-Machines, Inc.

Euro-Machines introduces the EUROSELECT destemmer with a new, patented design, made by the Scharfenberger Co. in Germany. This destemmer offers premium wineries an alternative to today's conventional destemmers. They feature adjustable speeds and superior petiole removal and are suited for direct dump or sorting-table feeding. The EUROSELECT destemmer offers a maximum capacity of 12 tons per hour (tph).



Euro-Machines' Rauch destemmer/crusher line has been updated with greater capacity units (up to 40 tph) and new and innovative features, yet retain its sturdy construction, reliability, and ease of cleaning.

The EUROPRESS EHS press is regarded as a first-rate press for small- to medium-size wineries, allowing winemakers the option of an open or closed press, taking only 15 minutes to convert.

Euro-Machine's open-style EUROPRESS EHP and closed-style EHT presses are available in 1,200-liter to 32,000-liter capacities. The EHP and EHT will receive new modifications in control and design due to Euro-Machine's continued research and winemakers' input.

Euro-Machines is pleased to announce that 2004 marks its 20th year of business in North America and that its partner company, Scharfenberger, has reached 75 years of selling and servicing equipment to wineries and vineyards.

For more information, contact:
Euro-Machines, Inc. West Coast
4950 Fulton Dr., Ste. E, Cordelia, CA 94534
tel: 707/864-5800; fax: 707/864-5879
e-mail: mattateuro@aol.com website:
www.euromachinesusa.com
East Coast
PO Box 843, Culpepper, VA 22701
tel: 540/825-5700; fax: 540/825-5789
e-mail: bernd@euromachinesusa.com

PLEASE SEE EURO-MACHINES AD, PAGE 63.

Tonnellerie Quintessence

Traceability, consistency, and customization are the cornerstones of Tonnellerie Quintessence Bordeaux (TQ). 100% of wood sourcing via the cooperage's own stave mills gives TQ direct access to premier forests. The cooperage is able to guarantee the tightness of the wood grain, the maturation period (Bureau Veritas certificate), and ensure consistency of supply.

When the wood is processed for barrel production, each lot is coded to record date of production, air-drying time, grain type, and wood origin.

After each barrel is in use at the cellar, a discrete barcode attached to each barrel allows TQ to trace the entire history from log to barrel. The cooperage uses eight quality control stations to measure the consistency of the production process. Each station follows strict standards for quality assurance. An intricate barcoding system displays the individual characteristics of each barrel. Ten variables outline the necessary requirements to *customize* barrels for each client.

Tonnellerie Quintessence crafts a rare barrel that blends contemporary expertise, with the style expected of a French cooperage.

For more information, contact:
Tonnellerie Quintessence
Brian Hartley, U.S. sales manager
PO Box 1851, Sonoma, CA 95476
tel: 707/935-3452; fax: 707/935-3422
e-mail: brian@tonnelleriequintessence.com
website: www.tonnelleriequintessence.com

PLEASE SEE TONNELLERIE QUINTESSENCE AD, PAGE 54.

S & N Airoflo, Inc.

In business for more than 50 years, S&N Airoflo produces aeration equipment for wastewater treatment. S&N builds Floating Brush Rotors in both hot-dipped galvanized or all stainless steel, in 5, 7½, 10, 15, and 20 horsepower models that are extremely efficient in both oxygen transfer and mixing. S&N units have consistently required 30% to 80% less energy than competitive models.

S&N equipment is used in open lagoons, equalization basins, oxidation ditches, activated sludge basins, and aerobic digesters across the U.S. and internationally, in both industrial and municipal applications.

S&N has led the way with design features such as UHMW water-lubricated bearings that are maintenance-free, and a blade and rotor design that maximizes efficiency. All S&N units have a welded frame design that is the strongest in the industry.

For more information, contact:
S & N Airoflo, Inc.
104 Eastman, Greenwood, MS 38935-1994
tel: 800/844-4524 (toll-free)
fax: 800/761-4442
e-mail: matt@airoflo.com
website: www.airoflo.com

Pickering Winery Supply

Pickering Winery Supply offers stainless steel tanks from Modern Stainless & Design, and French oak, Eastern European oak, and American oak barrels from three coopers.

Modern Stainless & Design (MSD) manufactures some of the finest tanks available, with high-grade finishes, and tank stands built to zone-four-spec standards. The latest technology is used to increase production and hold down costs. As a result, MSD has become one of the largest tank producers for the California wine industry. MSD has its own trucks and cranes to offer greater value to the customer.

Tonnellerie Doreau barrels are made from only the tightest-grained wood (less than 2mm between growth rings). The barrels' initial success has been with long-aging Bordeaux red wines; however, the barrels' elegance and slow extractability have proven ideal for Chardonnay, Italian reds, or any wines that require an oak backbone for high-quality fruit.

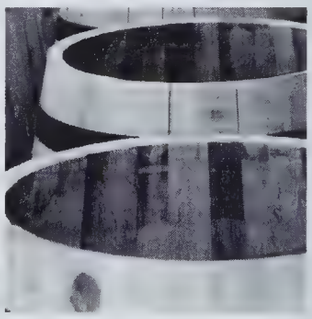
Tonnellerie Vernou's success has been earned by controlling barrel crafting from the "grumes" to finished barrels. The production goal is to provide consistent barrels every year. In addition to familiar forest offerings, customers can specify Pinot Noir or Chardonnay barrels with longer toasts, "waterbent" for Sauvignon Blanc, 24-month air-dried American oak, or the hybrid AOFO barrel, which captures the best of American oak staves and French oak toasted heads.

Tonnellerie Meyrieux toasts barrels over small braziers for 1½ hours to achieve a smoky, fruit-driven barrel ideal for Burgundy varietals and Syrah. Production is limited from this tiny Burgundian cooper.

For more information, contact:
Pickering Winery Supply
888 Post St., San Francisco, CA 94109
tel: 415/474-1588; fax: 415/474-1617
e-mail: pickering@sbcglobal.net
PLEASE SEE THE PICKERING AD, PAGE 71.

Artisan Barrels

Jérôme Aubin of Artisan Barrels is the exclusive U.S. representative of Tonnellerie Rousseau in Burgundy and Tonnellerie Saint Martin in Bordeaux, and a distributor for Tonnellerie Allary in Cognac (puncheons and small barrels). Artisan Barrels also markets French oak alternatives such as oak chips and the new Barrel Ersatz oak integration system.



Tonnellerie Saint Martin, a family cooperage in Bordeaux, selects the finest staves available (24- and 36-month regimens) from ancient forests in Allier, Vosges, Troncais (for red wines), and Jupilles (white wines). Western U.S. wineries can order 225L Bordeaux Transport Ferré or Tradition (22mm or 27mm-thick staves) barrels, and Grande Reserve and eastern European barrels in 2004.

Tonnellerie Rousseau, in Burgundy, is a medium-size cooperage producing Burgundy-style barrels (228L Transport and Tradition). Single-forest or blended-French oak staves are air-dried for 24 to 36 months. Rousseau has earned a solid reputation for custom-making of ovals and upright fermenters. Pinot Noir, Chardonnay Selection, and Troncais barrels will be available in limited quantity.

Tonnellerie Allary, an award-winning cooperage in Cognac, specializes in coopering puncheons (500L French or American oak) and small wine and vinegar barrels that will be available for purchase online via a secured payment site.

For more information, contact:
Artisan Barrels
Jérôme Aubin
6050 Colton Blvd., Oakland, CA 94611
tel: 510/339-0170; fax: 510/339-0173
e-mail: jerome@artisanbarrels.com
website: www.artisanbarrels.com
PLEASE SEE ARTISAN BARRELS ADS, PAGES 33, 60.

ColloPack Solutions, LLC

ColloPack Solutions provides premier lines of processing and bottling equipment to the wine industry. A comprehensive range of equipment enables ColloPack to offer solutions for virtually every major step in wine production, from grape receiving to bottle and case packaging.

ColloPack SOLUTIONS LLC

Manufacturers represented by ColloPack include:

- Diemme — membrane and screw presses; destemmer/crushers; grape sorting; and plate type lees filters.
- Bertolaso — integrated bottling lines including low-vacuum gravity and counter-pressure fillers; corkers; cappers for ROPP, crown, and plastic closures; bottle cleaners; micro-filtration systems; bottle conveyors and line automation.
- Robino & Galandrino — capsule dispensers; thermal heat-shrink capsule applicators for PVC; capsule spinners for composite and tin; wirehood and champagne capsule applicators.
- Cavagnino & Gatti — rotary wet-glue and pressure-sensitive labelers.
- Cames — bottle washing; and cork orientors.
- Berchi — bottle and carton depalletizers/palletizers; carton conveyors; and bottle casers/decasers.
- Perrier — sparkling wine disgorging machinery.
- Francisco Oller — sparkling and still-wine agglomerated closures.

ColloPack is dedicated to providing every customer with superior service and support and maintains a comprehensive local inventory of over 5,000 different spare parts. ColloPack has a team of experienced, trained technicians for installation, start-up, and post-sales service of the company's complete range of equipment.

For more information, contact:
ColloPack Solutions, LLC
Dave Means, Phil Giacalone, Rick White, Joe Mironicki, Mike Wlodarczyk, Greg Fulford
193 Camino Dorado, Napa, CA 94558
tel: 707/258-3940; fax: 707/258-3949
e-mail: sales@collopack.com

PLEASE SEE COLLOPACK AD, PAGE 27.

Westec Tank Company

The Alary Corporation continues to improve and innovate for the wine industry. Its state-of-the-art approach, along with experienced and well-trained personnel, permits production of top-quality equipment.

Westec Industries, a division of The Alary Corporation, has added an exciting new product to a long line of winery equipment. The OX BOX, used in conjunction with oak integration systems, is designed to replicate micro-oxygenation of a barrel within stainless steel tanks.

The standard OX BOX comes with a four-channel manifold and all the necessary sparge stones, tubing, and fittings for four tanks. The OX BOX can also be customized, allowing for any number of tanks.

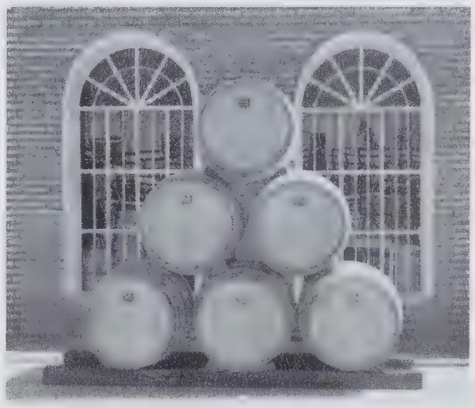
Other Westec Industries products include: stainless steel tanks in 100 to 350,000 gallon capacities, catwalks, sump carts, wine lines, conveyors, sorting tables, heat exchangers, hoist systems, irrigators, valves, fittings, and many other products for the wine industry.

IRAPP continues to set the standard for refrigeration engineering and building and installation of packages. IRAPP has put refrigeration into wineries for many years, always looking for better, more efficient methods. The high efficiency systems IRAPP builds are both money- and energy-saving, leading the way into the future.

For more information, contact:
The Alary Corporation
PO Box 129, Healdsburg, CA 98448
tel: 707/433-9471; fax: 707/431-8809

Woodlands Trading Co.

Woodlands Trading Company, Inc., offers top-quality French, Eastern-European, and American oak barrels to the western U.S. wine industry. Woodlands is a member of the Associated Cooperage Industries of America (ACIA) and is a leading supplier of the finest oak staves for fabrication of barrels in Europe.



All Woodlands barrels are coopered in Spain utilizing the skills of family-owned cooperages with several generations of experience. Experience, coupled with unmatched attention to wood selection, make Woodland's barrels as unique as the country in which they are crafted.

Woodlands oversees the quality of its products beginning when the rough staves are sawn. From there, the staves travel to Andalucía for seasoning in the incomparable climate of southern Spain. After the staves are seasoned for a period of no less than two years, they are fashioned into some of the finest barrels available on the market today — and at a reasonable price.

Try Woodlands French, European, or American oak barrels today, and give your wine the profile it deserves.

For more information, contact:
Woodlands Trading Co., Inc.
210 Castle Dr.
West Mifflin, PA 15122
tel: 412/466-8264; fax: 412/466-2224
e-mail: woodlandstc@yahoo.com

PLEASE THE WOODLANDS AD, PAGE 77.

P&L Specialties

P&L Specialties provides comprehensive design, engineering, fabrication, and installation of winery equipment. The company's specialty is crush pad/fruit handling systems and catwalk/support systems. P&L Specialties' full-service fabrication shop produces high-quality stainless steel and aluminum equipment and offers equipment installation, machine shop services, field service, and maintenance programs.

P&L Specialties' experienced design/-engineering team values two-way communication in developing solutions for your project. The team uses its experience to take the "surprises" out of projects. A state-of–the-art fabrication facility is fully equipped to complete the most demanding projects on time and is staffed with expert craftsmen to get the job done right.

Products include: sorting tables, belt conveyors, receiving hoppers, screw conveyors, 35-lb. lug washers, half-ton bin dumpers, pump-over carts, catwalks, destemmer stands, press-loading hoppers, vibrating tables, overhead trolley hoists, rotary screens, fitting boards, hose racks, the "Brix Buddy," cellar equipment, and many other custom-fabricated items.

P&L Specialties has proudly served the wine industry since 1984 and will stand behind its products and be in business when customers need it. P&L Specialties appreciates the opportunity to demonstrate its commitment to producing the highest quality equipment, satisfying customer expectations, and delivering on-time performance.

For more information, contact:
P&L Specialties
1450 Industrial Ave., Sebastopol, CA 95472
tel: 707/829-4811; fax: 707/823-2994
website: www.pnlspecialties.com

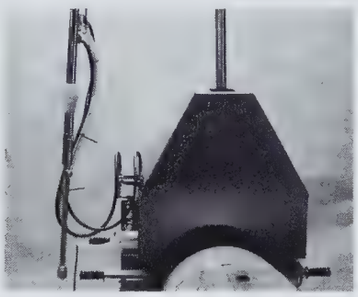
PLEASE SEE P&L SPECIALTIES AD, PAGE 61

ARS Pressure Washer Co.

When you need to clean, sanitize, sterilize, or humidify anything in or around your winery, ARS/Pressure Washer Company (ARS/PWC) has the products and expertise to meet your needs.

For more than 30 years, ARS/PWC has been providing high-quality equipment, plus repair and maintenance services for all equipment offered. Its experienced staff specializes in solving even the most challenging of applications using innovative and affordable methods.

With sales staffs across the U.S., ARS/PWC can respond to your specific challenges efficiently. Equipment overhauls can be done at ARS/PWC's showroom facility in Calistoga, CA.



ARS/PWC's SWASH™ (pictured), an all-purpose cleaning and sanitizing system, is the first system designed to clean and sanitize barrels, bottling lines, tanks, and facilities. With the SWASH, customers invest in equipment useful throughout the year for a wide variety of cleaning and sanitizing applications.

ARS/PWC proudly represents: Hydro Tak pressure washers, Moog clean-in-place barrels washers, Bitard Bordeaux barrels rinsers from France, Electro-Steam portable steam generators, and Fogmaster® humidifiers. A wide variety of accessories and appliances for specific applications are also offered.

The ARS/PWC showroom is open by appointment. Call to see how "We work well under pressure."

For more information, contact:
ARS/Pressure Washer Company
1184 Maple Ln., Calistoga, CA 94515
tel: 707/942-8330; fax: 707/942-8337
e-mail: info@arsenterprises.com
website: www.cleanwinery.com

PLEASE ARS/PWC AD, PAGE 28

Tonelería Magreñan

For almost 200 years, Tonelería Magreñan has been a respected, family-owned cooperage in Spain. Realizing the importance of control over raw materials, Magreñan maintains one of the largest on-site stocks of 100% naturally-cured staves in all of Europe.

The cooperage offers 225-liter Bordeaux Export and 228-liter Burgundy profile barrels, 300-liter hogsheads, 500-liter puncheons, and upright tanks in 5,000-liter and 10,000-liter capacities (built to order). All barrels are built to order at Magreñan to assure that each is freshly coopered and has not suffered in storage. Wood selections include: Allier, Troncais, Nevers, American, Hungarian, Russian, and Romanian oak.

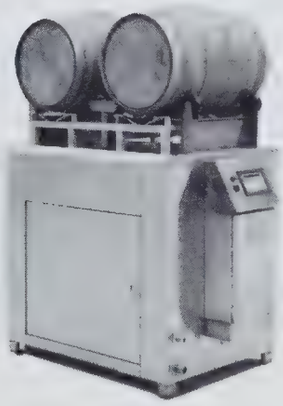
Barrel quality and service are most important to winemakers. As exports have become a major focus in recent years, the brother-and-sister team of Antonio and Teresa Magreñan have traveled extensively to establish a global network of sales and service in all major wine producing countries, including: France, Italy, Portugal, Australia, New Zealand, Greece, South Africa, U.S., Chile, Argentina, and Uruguay.

Magreñan has earned ISO 9001:2000 certification for its hand-made manufacturing process and ISO 14001:1996 certification for environmental management systems.

For more information, contact:
Craig Thornbury, Agent to the Americas
30 Feeney Drive, Rohnert Park, CA 94928
tel: 707/217-0837
e-mail: senorcraig@cs.com
website: www.magrenan.es

Process Engineers, Inc.

Process Engineers, Inc., (PEI) has served the wine industry for more than 40 years. PEI designs, manufactures, and installs systems for the complete spectrum of grape processing and packaging. PEI serves as a manufacturer's distributor to such companies as Waukesha Fluid Handling (pumps, etc.) and represents many other manufacturers and types of pumps, (centrifugal, positive displacement, and pneumatic).



PEI valves are a wine industry standard (ball, butterfly, divert, diaphragm). PEI also supplys controls (loop, PLC), stainless fittings, tubes, hoses, and gaskets.

PEI is a leader in design and supply of automated pump-over systems using dedicated fixed-place pumps.

Custom systems for automated pumping/patching, heat transfer (automated must, juice, wine heating and cooling), and CIP are designed and built by PEI.

For many years, PEI provided major process equipment (destemmer/ crushers, presses, filters, barrel washers, etc.) imported from Europe. PEI now offers American-designed and built process equipment, utilizing standard and locally available parts.

PEI has a strategic alliance with DEL Agricultural Ozone authorizing PEI as a direct distributor of DEL ozone equipment, including but not limited to DEL's standard wine industry ozone machines — the AGW-0500 mobile ozone surface sanitizer and the AGW-1500 mobile recirculating ozone system.

For more information, contact:
Process Engineers, Inc.
26569 Corporate Ave., Hayward, CA 94545
tel: 800/972-0904; fax: 510/785-8187
e-mail: michael1pei@aol.com
PLEASE SEE PEI AD, PAGE 119.

Vingenuity Inc.

Vingenunity focuses exclusively on reducing earthquake and operational risks in wineries and has become an innovative source for operational efficiency and earthquake protection products since 1997.

Innovate Invent Protect

Vingenuity Incorporated

Services performed by Vingenuity include seismic hazard mitigation of wine barrel stacks, disaster planning, response training, winery-operations consulting, and earthquake-hazards training.

Vingenuity founder Joshua Marrow, an authority on earthquake and operational hazards in wineries, has developed custom solutions for earthquake hazards, including the Cradle Extender® and Rack Positioning System® (RPS).

The Cradle Extender reduces barrel damage by keeping the top rack of barrels from shifting or falling from barrel-pallet stacks during earthquakes and transport. Two easily installed pieces passively confine the top barrels to the rack, lowering the potential for damage to the entire stack.

RPS units align wine barrels and racks to assure vertically straight stacks, which are essential for earthquake protection and improved safety in the cellar for workers and visitors. They are fixed to barrels at specific locations and provide a "gate" to keep racks in place during normal operations and earthquakes.

Vingenuity is dedicated to the success of your winery. Please visit the website for a virtual tour of these solutions.

For more information, contact:
Vingenuity Incorporated
175 Bluxome St., Ste. 325,
San Francisco, CA 94107
tel: 415/543-5439; fax: 415/651-8799
e-mail: info@vingenuity.net
website: www.vingenuity.net

Barrel Builders, Inc.

Barrel Builders is the exclusive distributor of Tonnellerie Marchive barrels from France, Budapesti Kadar barrels from Hungary, and East Bernstadt Cooperage (EBC) barrels from Kentucky, and exclusive supplier of ProxyClean™, a non-chlorine-based cleaner for use throughout the winery.

Barrel Builders offers a range of silicone bungs including traditional solids, EasyGrip, and FermRite styles. Other products include a simple barrel rinser, repair products, and oak chips.

Located in the heart of the Cognac region, **Tonnellerie Marchive** was an early pioneer of the long, slow toasting process. Marchive produces a full range of Burgundy, Bordeaux, and 265-liter barrels using woods sourced from forests in France.

Budapesti Kadar, first introduced to the U.S. in 1993, is celebrating 58 years of production. Oak for the cooperage's Burgundy, Bordeaux, and 265-liter barrels is sourced exclusively from the Zemplen forest in Tokai and is similar in texture and flavor to the oaks of central France.

Barrel Builders' American oak barrels are coopered by EBC from two- and three-year seasoned wood. A Bordeaux-style barrel is offered in a range of toast levels.

Barrel Builders' full-service shop offers barrel reconditioning and repairs, barrel-insert systems, and small- and custom-size barrels.

For more information, contact:
Barrel Builders
1194 Maple Ln., Calistoga, CA 94515
tel: 707/942-4291; fax: 707/942-5426
e-mail: barrel@napanet.net
website: www.barrelbuilders.com
PLEASE SEE BARREL BUILDERS AD, PAGE 67.

Sanitary Process Components

Sanitary Process Components introduces the economical M25E barrel washer. The M25E simultaneously washes and siphons off the water used during the cleaning process. Its compact design allows the unit to fit between stacked barrels. A motorized spray turret offers complete orbital coverage and the M25E works with hot or cold water-pressure washers.

The M25E uses the venturi effect to successfully drain the water used during and after the wash cycle. It is lightweight and can be conveniently stored after use. Contact Sanitary Process Components to obtain a demonstration video on the M25E.

Sanitary Process Components also offers a complete line of winery hoses and wash-down equipment. Radial crimp hose assemblies with various sanitary hose-fitting ends, including sanitary clamp, bevel seat, I-Line, and John Perry are available.

For more information, contact:
Sanitary Process Components
3711 Vineland Rd., Orlando, FL 32811
tel: 407/650-8988; fax: 407/650-8944
e-mail: sales@spc-fl.com

PLEASE SEE SANITARY PROCESS AD, PAGE 74.

United Barrels

United Barrels has formed a relationship with Nestroff Wine Barrels, a premium Bulgarian cooperage since 1870. In the last 10 years, the Nestroff family has invested heavily to replenish wood stocks and re-enter the export market with top-quality craftsmanship. The cooperage's current markets include France, Italy, Greece, and Germany. Trials in California in 2003 offered encouraging feedback. The cooperage will limit production to 3,000 barrels per year.

The French oak cooperage Tonnellerie Chalufour has aggressively revamped its production procedures, emphasizing technical soundness. In addition to its trademark Chardonnay and Syrah barrels, Chalufour has introduced a new "long toast" in which barrels spend 20 minutes longer on the fire at low temperatures.

Tonnellerie Allary continues to impress new customers with its ultra-traditional Bordeaux-varietal barrels and uses only hand-split, two-year, air-dried stavewood from the same five suppliers it's worked with for 50 years. This ensures the ultra-tight grain and consistent toasty-caramel aromas so prized in long barrel-aged wines.

Moxon Timbers offers an ever-increasing selection of tank-stave systems, chips, dominos, and barrel inserts that bring treasured roasted aromas into the reach of not only major production facilities, but of small- to medium-size wineries at very favorable pricing.

For more information, contact:
United Barrels
1804 Soscol Ave., Ste. 100, Napa, CA 94559
tel: 707/258-0795; fax: 707/259-5324
e-mail: harrops@napanet.net

Raynox 2000, Inc.

Raynox 2000, Inc., manufactures custom-fabricated stainless steel tanks and equipment for small and medium-size wineries.

Stationary, insulated, stainless steel tanks built by Raynox for maceration, fermentation, and storage are available with floating or closed tops and cooling or heating jackets. Comparable to the best European tanks with high standards for welding and polishing, the tanks are sold throughout Canada and the U.S. Raynox has developed in-house equipment to reproduce the swirl pattern of the European finish at an excellent price.

Raynox fabricates custom accessories, such as draining cages, cap punchers, cooling plates, decanters, oak chip containers, and more.

Stackable, stainless steel barrels are available for storage use or as fermenter barrels. All products are made to the customer's specific requirements.

Small and medium-size wineries have space constraints. Because Raynox is the manufacturer, it can modify tanks, products, and equipment to a winery's requirements, helping to maximize winemaking capacity.

For more information, contact:
Raynox 2000, Inc.
Jocelyne Senécal
1148 St. Michel, St. Cesaire
Quebec, Canada J0L 1T0
tel: 866/469-4181 (toll free)
fax: 450/469-2112
e-mail: raynox@raynoxinc.com
website: www.raynoxinc.com

PLEASE SEE RAYNOX 2000 AD, PAGE 24.

Simonds Machinery Co.

"Pumping Solutions Since 1905" with quality products, service, and value is what sets Simonds Machinery apart. Simonds Machinery offers a complete range of pumps to fit most every application by representing Deming, Graco, Jabsco, Ampco, and Roper. Factory-trained service technicians are available.

Deming offers end-suction centrifugal pumps for wineries with semi-open impellers for smaller solids/juice transfer, and a vortex impeller for larger solids and pump-overs. Deming also offers 2-inch flapper valve air-operated double diaphragm pumps.

Graco stainless steel air-operated diaphragm pumps come with an industry-leading air-valve design. A free 60-day trial is offered so that you can "test drive" before purchase.

Jabsco is famous for its flexible impeller pumps. You might not know that Jabsco makes a rotary lobe pump that provides great performance, competitive pricing, easy maintenance, and is an industry leader in sanitary design.

Ampco sanitary centrifugal pumps have complete interchangeability with the Tri-Clover AC Series and the Waukesha Purity Series.

Simonds can provide pumps for frost application and waste water projects.

Call Simonds Machinery Company with your next requirement!

For more information, contact:
Simonds Machinery Company
304 Industrial Way, Brisbane, CA 94005
tel: 800/750-4830; fax: 415/468-1524
e-mail: pumps@pacbell.net
website: www.smc4pumps.com

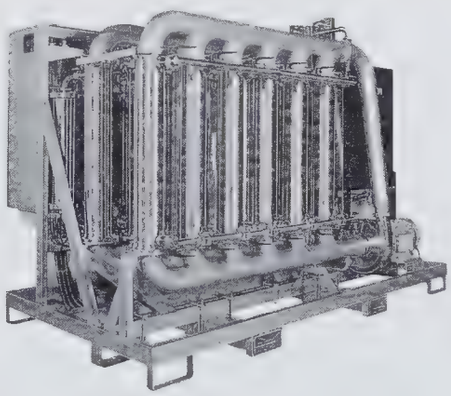
PLEASE SEE SIMONDS MACHINERY AD, PAGE 84.

GusmerCellulo Company

Gusmer*Cellulo*'s collaboration with Vaslin-Bucher has brought the next generation of cross-flow filters to the U.S. wine industry. Vaslin-Bucher has engineered a fully automated cross-flow filtration system that clarifies and prepares wines for sterile filtration, all in one step.

The Vaslin-Bucher FM filter fully respects the quality of your wines! It utilizes low filtration pressure (1.2 bar), kept at a constant level via a positive displacement feed pump, and operates with essentially no increase in temperature (5°F maximum). Back-pulse technology optimizes the flow rate, and there is no spent filter media to dispose of. The FM filter is easy to use and capable of operating around the clock without direct operator supervision.

Models ranging from 20 square meters to 180 square meters offer an average flow rate from 130 gallons per hour to 5,200 gallons per hour. There is an FM filter appropriately sized for every winery.



Evaluate a Vaslin-Bucher FM filter at your facility with the FM40 demonstration unit. This fully automated 40-square-meter filter is trailer-mounted and can be brought to your facility for a production trial. Contact your Gusmer*Cellulo* representative for details.

For more information, contact:
Gusmer*Cellulo* Company
Don Krull, Shadow Ostowari, Phil Crantz, Ken Stewart, Dave Gusmer, Kathy Bollock, Rodger Paschelbel
81 M St., Fresno, CA 93721
tel: 559/485-2692; fax: 559/485-4254
e-mail: sales@gusmercellulo.com
website: www.gusmercellulo.com

PLEASE SEE GUSMERCELLULO AD, PAGE 8.

Tonnellerie Boutes

Boutes has been a family tradition for over 120 years. Family-owned and operated by Henri Barthe and his two sons, Eric and Pierre, Tonnellerie Boutes is located in the heart of the Bordeaux region of France.

Through the Office Nationale des Forêts, Boutes self-sources 75% of its stave-grade standing trees from the best forests in France. For over 10 years, this has made Boutes the leading purchaser of standing trees in the Department of Allier. Purchasing by this method would not be possible without the skill, experience, and knowledge of Boute's foresters who annually assess the wood available for purchase.

Unique to Boutes is the *stave immersion* process that prepares and controls the refining of oak tannins. This, along with exclusive use of the finest oak woods and the knowledge of its master coopers, allows Boutes to offer a unique blend of *innovation*, *tradition*, and *art* in crafting barrels that achieve perfect harmony between wine and the barrel.

Barrel sizes available are: 225L, 228L, 265L, 300L,and 500L.

For more information, contact:
Tonnellerie Boutes
Manny Martinez
tel: 510/799-1518; fax: 510/799-1557
e-mail: boutesusa@aol.com
website: www.boutes.com

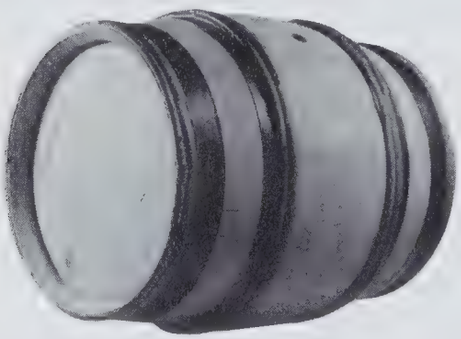
PLEASE SEE TONNELLERIE BOUTES AD, PAGE 34.

Tonnellerie Sirugue

Tonnellerie Sirugue is a family cooperage established in 1903 in Nuits Saint Georges, Burgundy. Sirugue's barrels were among the first French oak barrels to be imported to the U.S. for fine wine ageing in the late 1950s and 1960s.

Today, Sirugue focuses on wood selection, which is the basis of the cooperage's tasty barrels. Sirugue's wood is selected exclusively from French oak forests in the Allier, Nevers, Chatillon, and Vosges regions. The staves are naturally air-dried in Burgundy for a minimum of 24 months. A 36-month, air-dried program is available by reservation.

Sirugue produces Burgundy Traditional, Burgundy Export (228L), and Bordeaux Export barrels (225L).



Aside from its traditional house toast, Sirugue has worked intensively to achieve different toasting levels tailored to each customer's individual needs and style demands.

Sirugue's goal is a seamless integration of fruit and oak. Its barrels can be sweet, spicy, subtle, and elegant; they enhance a wine's fruit characters and flavors; they lift the fruit, frame it, and make a star out of it.

For more information, contact:
Tonnellerie Sirugue
Francoise Gouges-Guberman
2343 33rd St., Santa Monica, CA 90405
tel: 310/452-8147; cell: 310/403-8398
fax: 310/452-7847
e-mail: sirugueusa@earthlink.net

Valley Pipe & Supply, Inc.

Valley Pipe & Supply, Inc., currently in its 64th year in business (with headquarters in Fresno, CA, a branch office in Napa, CA, and sales offices in Sonora, Mexico, and Niagara-on-the-Lake, Canada), was founded in 1940 as a supplier to food processing, chemical, industrial, and OEM manufacturing plants in the San Joaquin Valley and began importing and manufacturing equipment for wineries throughout the U.S., Mexico, and Canada in the late 1980s.

To provide more service to customers, a full-time technician, trained at several overseas factories, is available for machinery Valley Pipe & Supply represents.

The Napa showroom displays: membrane presses, automatic punch-down tanks, the "Puntarossa" automatic punch-down and pump-over combination tanks (manufactured by Defranceschi S.p.A.), Milani Antares destemmers, Spadoni filters, Enopompe piston pumps, BCM flexible impeller pumps, other winery pumps, and supplies.

Banding of Valley Pipe & Supply "Cuvee" rubber hose and several styles of PVC hose is done at the Fresno and Napa locations. Fabrication of stainless hoppers, dumps, conveyors, three-way must valves, Valley Pipe & Supply pumps, and PCT fittings is done in Fresno.

Valley Pipe & Supply thanks the wine industry for its patronage and support and looks forward to serving you in the future.

For more information, contact:
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tel: 559/233-0321; fax: 559/233-1713
e-mail: valleypipesupply@aol.com
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tel: 905/468-3719; fax: 905/468-3048
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tel: 637-37-273-82

PLEASE SEE VALLEY PIPE & SUPPLY AD, PAGE 36.

Saeplast

Saeplast manufactures a wide range of insulated containers and pallets to meet the wine industry's strength, hygienic, environmental, and user-friendly requirements.

Saeplast's insulated containers are the result of more than three decades of innovative research and development. All containers are constructed of FDA-, Agriculture Canada-, and USDA-approved materials for food application. These food-approved materials prevent the transfer of odor or taste, and the containers' insulating properties aid the fermentation process and protect perishables during transport and harvest.

Design features include: smooth interior walls for quick and easy clean-up, a well-fitting latch-down lid with optional seal, an optional 3-inch drain opening (available in selected models), a reinforced base with center beam allowing versatility in handling, and a day-marker insert for content identification.

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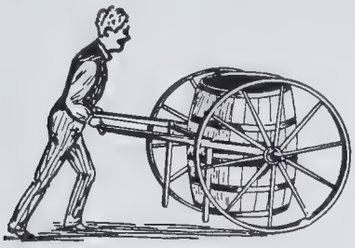
British Columbia V4G 1N1 Canada
tel: 800/665-3966
e-mail: saeplast@saeplastcanada.com
website: www.saeplast.com

Bouchard Cooperages

Bouchard Cooperages is a barrel brokerage representing: **Keystone Cooperage** (Jefferson, PA), **Les Tonnelleries de Bourgogne,** an association of the coopers **Damy** (Meursault) and **Billon** (Beaune); **Tonnellerie Vicard** (Cognac); **Tonnellerie Lafitte** (Cognac); and **Tonnellerie Cadus** (Ladoix-Serigny).



Keystone Cooperage, started in 2001 by the Wilson family, produces a maximum of 7,000 barrels per year of ultra-premium Appalachia forest American oak barrels.

Les Tonnelleries de Bourgogne, has provided barrels and puncheons to American producers of Chardonnay and Pinot Noir for more than 20 years.

Tonnellerie Vicard is a 100% family-owned and operated company, ISO 9002-certified for barrel fabrication, incorporating the latest technology to control the heating process with age-old tradition to produce barrels, puncheons, and tanks.

Tonnellerie Lafitte, managed by Jean Vicard, produces high-quality Bordeaux barrels from American and hand-split Hungarian oak, air-dried for three years.

Tonnellerie Cadus is a partnership of Maison Louis Jadot of Burgundy, Tonnellerie Vicard, and Vincent Bouchard to produce ultra-premium barrels from three-year air-dried oak.

In partnership with the above coopers, Bouchard Cooperages has commissioned an analytical survey of barrels produced. The primary goal is to determine whether "cooper style" can be graphically demonstrated. Please visit the company's website, www.bouchard-cooperages.com, for further information.

For more information, contact:
Bouchard Cooperages, Barrel Brokers
Roberta Manell Montero, Gerhard Ziemer
743 Wilson St., Napa, CA 94559
tel: 707/257-3582; fax: 707/254-0852
e-mail: barrels@napanet.net
website: www.bouchardcooperages.com

PLEASE SEE BOUCHARD COOPERAGES AD, PAGE 12.

Napa Fermentation Supplies

Napa Fermentation Supplies offers a full line of winemaking equipment and supplies, including LA Inox stainless steel tanks in variable capacity with adjustable lids from 26 gallons to 1,321 gallons and closed-top tanks from 79 gallons to 3,963 gallons, with or without manway.

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For more information, contact:
Napa Fermentation Supplies
575 Third St., Bldg. A, Napa, CA 94559
tel: 707/255-6372; fax: 707/255-6462

PLEASE SEE NAPA FERMENTATION AD, PAGE 76.

Winesecrets

Winesecrets offers a "better mousetrap" for tartaric stabilization by introducing

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- Predictable production rates.
- Reliable stability from continuous, in-line conductivity monitoring.

STARS uses electrodialysis (ED) to remove tartrates and their cations from wine through selectively permeable membranes. The process is controlled by the change in conductivity resulting from removal of tartrate salts from wine. ED-based systems for wine were developed by France's Eurodia Industrie and INRA during the 1990s. They are recognized by the International Office of Vineyards and Wines (OIV) as "good practice," approved for commercial use by the European Union for all classes of wines. More recently, the U.S. TTB has decided to accept applications from wineries to use STARS as part of their winemaking practice.

Twenty wineries and three mobile services in France, Italy, and Spain have adopted Eurodia's tartrate removal systems. Winesecrets offers a mobile service which operates at 600 gallons per hour, and stationary units operating at 300, 600, 1,200, or 2,400 gallons per hour.

For more information, contact:
Winesecrets
101 S. Coombs St., Ste. F, Napa, CA 94559
tel: 707/255-9107; fax: 707/255-9167
e-mail: eric@winesecrets.com
website: www.winesecrets.com

IN THE CELLAR *by Jake Lorenzo*

Grapevines & grandbabys

Jake Lorenzo sits in a Seattle, WA, hospital. He's fine, but Jakelyn is screaming in the next room. Her mother is with her. So is her husband. It's nothing to worry about; Jakelyn is having another baby.

The due date was November 12, and Jakelyn's mother insisted we arrive on that very day. "Jakelyn will need us at the hospital and to watch the grandbaby," she said. "It's always good to have family around during labor."

Personally, this makes no sense to Jake Lorenzo, who knows in his soul of souls that the last place a man should hang out is in the proximity of a woman in labor. Women in labor have no patience for men, and Jake Lorenzo also knows that it's a myth when women tell each other, "The second one is much easier."

Jake may not know much, but he does know that if you try to pull something that weighs more than six pounds out of your body, it is going to hurt like hell, and previous experience is not going to make it easier.

It's been nine years since Jakelyn had Jake's first grandbaby. When Jakelyn and her husband told their first-born she would soon have a baby sister, she sat quietly. Then she thoughtfully walked up the stairs toward her room, as her parents watched. When she got to the landing she turned and said, "I've enjoyed being an only child."

So while Jakelyn's mother and husband shepherd her through the birth of Jake's new grandchild, Jake has the great good fortune of hanging out with Jakelyn's formerly only child. She is a very independent kid who spends untold hours watching the animal channel and is full of information on the eating habits of wolves, the mating rituals of elephants, and all things about dolphins. She's also a sharp dresser with a unique style sense. It's sort of retro-Cyndi Lauper with toe socks.

Jake and granddaughter take turns reading to each other. She's reading some horrific story about a house cat that gets left behind during a beach vacation and is forced to survive out in the wilds. Jake is reading horrific excerpts from *Fast Food Nation*, trying to ensure that she stays away from processed food in our nation's drive-throughs.

At one point, Jake's eldest granddaughter stops reading, looks at her grandfather and says, "I guess things are going to change, right Paw Paw?"

Jake Lorenzo gives her a hug. "Things always change. That's what keeps life interesting."

* * * *

Speaking of change, Jake Lorenzo has lived in Sonoma, CA, for 25 years, and he has seen a whole lot of change. He's not talking about over-planting vineyards or the disappearance of apple, pear, and prune trees. He's not talking about which varieties are planted, what the prices are, or who's not selling grapes. Jake Lorenzo is talking about the actual grapes themselves. Things in the vineyard have changed radically, which has dramatically affected the way wines are made.

Back in the late 1970s and into the 1980s, most vineyards were dry-farmed. The rootstock was St. George, although, by 1980, growers were shifting to AXR-1. Irrigation, when used, was either flood irrigation or overhead sprinklers about once or twice during the growing season. Grapevines had thick gnarled trunks and were either head-pruned or cane-pruned. Grapevines believed themselves to be living in some scene from *Dune*, parched in the desert hoarding every last drop of water, wasting no moisture.

The great Phylloxera debacle of the late 1980s led to massive replanting. That replanting coincided with new clones, new rootstocks, and widespread drip irrigation. Today, grapevines rise up on spindly trunks and spread out into a wide assortment of trellis configurations. They are jam-packed, fighting one another for space. But with the ease of irrigation, today's grapevines act like tourists at a trendy beach, who only need to motion the cabana boys for another drink.

Thirty years ago, grapes ripened with good flavors around 23° or 24° Brix. Once picked, they came into the winery, the acid was bumped with tartaric addition, and fermenting temperatures for reds ran between 80° to 85°F. Fermentations rarely stuck, and malolactic went through easily and completely.

Nowadays, grapes "don't taste right" until 27° or 28° Brix. They get picked, come to the winery, get a hit of DAP and yeast food, and ferment at 90° to 95°F. They struggle with high alcohol, have a miserable time finishing fermentation, and malolactic is often an ongoing nightmare that lasts well into the following spring.

Jake Lorenzo is not a viticulturist, but he is a hell of a private eye. In his line of work, good detectives know to keep things simple — and to follow the money. Rookie private eyes waste a lot of time running the labyrinths of deception. The grizzled veteran steps back and follows the basics.

When it comes to grapes, the basics are to get the things ripe before the rains come, and to keep the winemakers happy. If you can deliver grapes that have deep color and rich flavors, then you are perceived to be a good grower. Maybe a little common sense would be helpful.

Common sense tells Jake Lorenzo that high density in the vineyard might be a good idea in rich, valley soils where runaway vigor is a problem. Plant the vines close to one another, and have them compete for nutrients and water. He sees where this could be beneficial. He does not understand why you would use this same scheme on hills, or shallow clay soils where the extra competition may

deplete the few nutrients and the little moisture available to the vines in the first place.

Jake can see where a farmer would love the convenience of drip irrigation. To a farmer, good irrigation is an insurance policy that contributes to many a good night's sleep. It makes sense that more efficient, regular watering of vines could develop healthier vines and better tasting fruit. But Jake has to wonder about 8 to 10 gallons per week from June through harvest.

In the last couple of years, Jake has seen these new rootstocks shut down, almost out of spite. It's as if they are saying, "No more drinks, please. I've got a hangover." Watching their vineyards shut down causes farmers to panic, so they are experimenting with foliar sprays to hasten ripening "A little potassium never hurt anything," they say. Jake Lorenzo says follow the money. A lot of it is being spent on chemicals and consultants.

Once again, Jake is not a viticulturist, but perhaps it would be better to use a little less water and spread it out over the growing season? Try to use vine density to take advantage of your particular growing conditions. Regulate crop size to help ripen grapes. Be as natural as possible. Don't be spraying things onto your vines and into your soil until you know what they are going to do, and what the long-term effects will be. In short, try to simplify everything in the vineyard.

Jake Lorenzo is not a winemaker either, but does it make sense to strive for intensity and extraction by letting fruit get very ripe, and then *diluting* it with water once it gets to the winery? Does all the chemical manipulation necessary to finish high-alcohol fermentations make better wine, or are you just treating the symptoms?

It could make more sense to work with your grower to get ripe flavors at lower sugars. That would reduce the alcohol and problems with stuck fermentation and retarded malolactic.

If nothing else, think of the money you could save in taxes if your wines were under 14% alcohol. Maybe you could bank the savings for your grandkids' education fund. ■

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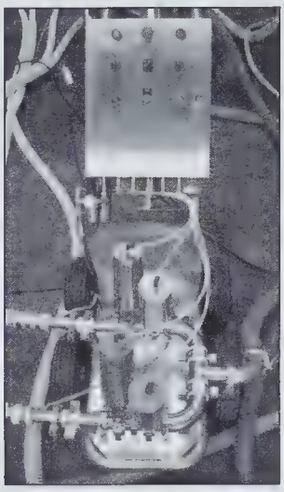

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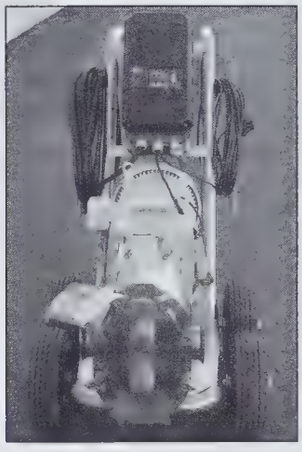

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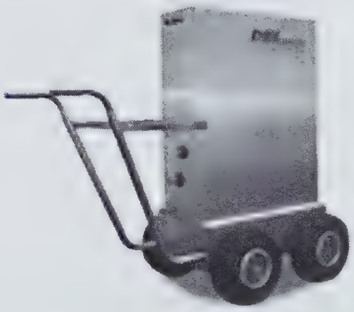

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SMART VITICULTURE *by Dr. Richard Smart*

Dr. Konstantin Frank, Vinifera pioneer in the eastern U.S.

Many eastern states now boast fledgling wine industries, and I have had the pleasure of visiting many of them. How many of these modern pioneers recognize that their efforts with vinifera vines can be traced to a Ukrainian immigrant of the 1950s?

This man was Konstantin Frank, who arrived in the U.S. penniless though he spoke five languages. (Unfortunately, none of them was English.) Frank had problems having his impressive qualifications recognized. He held a Ph.D from the Polytechnic Institute in Odessa, and he was director of an Institute of Viticulture and Enology in the Ukraine.

His background was of little immediate benefit in his new homeland. Menial work at the Geneva Experiment Station in New York state was offered to him. He was disparaging of the native vines and hybrids being grown in New York at the time and longed for the opportunity to grow vinifera.

Dr. Frank's opportunity came when he met Charles Fournier of Gold Seal Vineyards (Hammondsport, NY) in 1953. Fournier had been brought from France to produce sparkling wine. Even though he had introduced some French-American hybrids to New York, he realized they would never make great wine like the vinifera of his homeland.

Fournier and Dr. Frank compared notes about vinifera. The fear in New York was always that the winters would be too cold, but Dr. Frank told Fournier of the methods used in his native Ukraine. Fournier hired Dr. Frank to develop vinifera vineyards for Gold Seal.

This was no easy task. In the words of Fred Frank, Dr. Frank's grandson whom I recently interviewed, New York can be called the "epicenter of vine diseases." Three conditions present major challenges: downy and powdery mildew and phylloxera. Frank researched winter hardy rootstocks and grafting techniques to maintain vine health.

Dr. Konstantin Frank

The first vinifera vines were planted in the early 1950s. The harsh winter of 1957 provided a severe test. Gold Seal produced the first commercial vinifera wines in 1961. By 1966, there were 70 acres planted. Dr. Frank planted his own vinifera vineyards near Hammondsport in 1960, with the first commercial vintage in 1962. For 20 years, these were the only vinifera plantings east of California, according to Fred Frank.

Dr. Frank became a U.S. citizen and a vocal pro-American, known for always showing the flag in the front window of his house. He died in 1985.

Dr. Frank named his cellars "Dr. Frank's Vinifera Wine Cellars" to emphasize the vinifera origin. He influenced early pioneers in other eastern states including Arkansas and Pennsylvania. The 1976 Farm Winery Act of New York enabled growers to produce and sell their own wine. This act and Dr. Frank's early success with vinifera led to the establishment of an exciting wine industry in New York, part of it around the Finger Lakes where Dr. Frank planted his first vines.

The 25th annual edition of the *Wine Spectator* honored 54 individuals from around the world who have made a "lasting impact" on the world's wine industry. Dr. Frank was included among these for his legacy of establishing vinifera culture in the eastern U.S. His winery is now run by grandson Fred, who claims it as New York's most award-winning winery.

Riesling was always one of Dr. Frank's favorites, and it is turning out to be an important variety for the Finger Lakes region. His 1962 Trockenbeerenauslese was served in the White House. Rieslings from Vinifera Wine Cellars have won many awards at national and international wine shows, both for dry and sweeter styles. Recently, students from Geisenheim University in Germany visited the cellars to taste many Rieslings covering five decades, from 1962 to 2002. High natural acidity gives the wines long life.

Pinot Noir was also introduced into New York by Dr. Frank, and there are now devotees in the Finger Lakes regions with aspirations to develop a regional reputation for that grape variety. Dr. Frank's Pinot Noir was found in a Cornell University survey to contain the highest levels of resveratrol, a compound thought important in combating heart disease. High levels of resveratrol are found in the region's wines. Resveratrol is related to anti-fungal activity in the grape skins.

Another favorite of Konstantin Frank was the Rkatsiteli (er-kat-si-TEL-lee) white Russian variety. This is one of the most widely planted varieties in the world, yet is little known outside its native eastern European homeland. It is claimed to be one of the oldest known grape varieties. The variety was introduced to the U.S. by Dr. Frank and is known to be vulnerable to mildew and heat. It is now becoming something of a cult wine, with 2,200 cases produced by Vinifera Wine Cellars in the last vintage.

Fred provided a lineup of Rkatsiteli for me to taste, six wines with vintages from 1985 to 2002. The older wines develop golden colors with aged Riesling-like characters, and the younger wines are paler, with a spicy and citrus nose. Some people describe the flavors as hazelnut-like. Although not well known, the wines are recognized in competitions for their quality. For example, the 2002

Rkatsiteli won the Chairman's award at the 22nd Annual Riverside International Wine Competition.

Fred Frank told me that two other Eastern European varieties do well in the region. These are Sereksia, a white, and Saperavi, a red. Sereksia is particularly useful for a late harvest style.

Conclusion

Konstantin Frank was truly a visionary. He seemed to be forever battling the elements and those who could not accept his dream of commercial vinifera cultivation in the eastern U.S. His winery and vineyards survive him, and the awards now flowing to his Vinifera Wine Cellars are a testament to his foresight, the fruits of which are now being enjoyed by many other vinifera producers on the East Coast. ■

Dr. Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Launceston, Tasmania, in Australia. He can be contacted by e-mail: vinedoctor@compuserve.com. Read about Dr. Smart's business including his consulting schedule, educational wine tours, and seminars at his home page http://www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/ 838-6312 and http://www.vinquiry.com.

Assistant Professor Enology (01482)

Located in the Finger Lakes region of New York State, Cornell University is committed to creating a more diverse and inclusive campus in which to work, study, teach and serve.

Overview: The incumbent will be a key member of a multidisciplinary team of faculty affiliated with Cornell's Enology and Viticulture programs and will play a leadership role in a new undergraduate curriculum in enology/viticulture. (See www.nysaes.cornell.edu/fst/vb/ for an overview of the NYS wine industry and Cornell's Enology program).

Responsibilities: The incumbent will be expected to: teach undergraduate courses in winemaking and wine biochemistry and participate in other related courses; mentor undergraduate and graduate students, direct student research and administer student internships; develop and direct an innovative, externally-funded research program involving fundamental and/or applied aspects of enology. Specific areas of interest could include (but are not limited to) molecular biology of fermentative microbes; molecular, biochemical, or chemical processes affecting wine flavor, aroma and/or quality; microbial genetic approaches to improving grape fermentation, and winemaking technologies.

Salary: Competitive, commensurate with background and experience. An attractive fringe benefits package is available.

Qualifications: Ph.D. in Food Science, Enology/Viticulture, Microbiology, Molecular Biology, Biochemistry, Horticulture, or related field. Teaching, postdoctoral and/or industry experience in winemaking are desirable. A mentoring program for new faculty provides guidance and assistance. The Department actively encourages applications from women and minority candidates.

Application Procedure: Application review will begin March 1, 2004. Send a letter of application, resume, academic transcripts, statement of teaching and research goals and plans, and three letters of references to:

CORNELL

Dr. Kathryn Boor, Chair, Enology Search Committee
Department of Food Science
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413 Stocking Hall, Ithaca, NY 14853-7201
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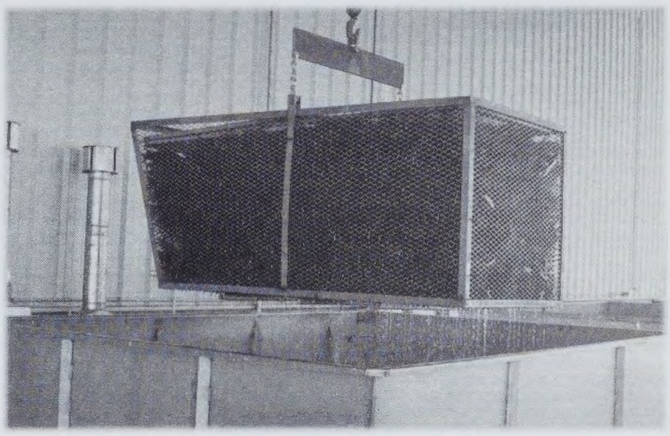

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Bouchard Cooperages	12	707/257-3582	707/254-0852	R. Manell-Montero
Brotemarkle, Davis & Co.	62	707/963-4466	707/963-4712	Thomas Davis
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California Grapevine Nursery	44	800/344-5688	707/963-1840	Christine Palmberg
Canton Cooperage	88	877/542-1158	707/544-7684	Brian Geagan
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Clear Skies Group	41	877/825-3374	516/483-8831	Ezra Green
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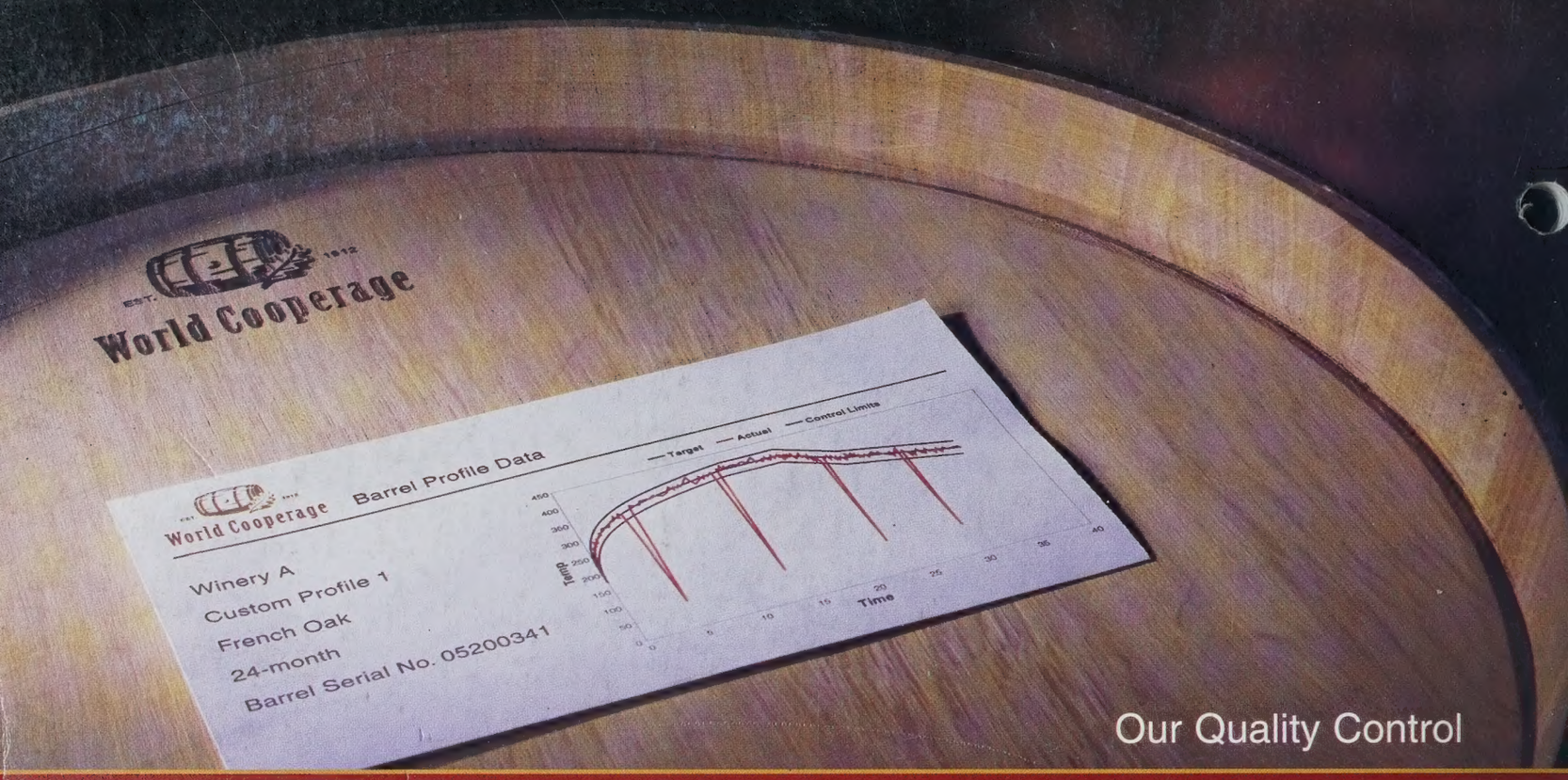

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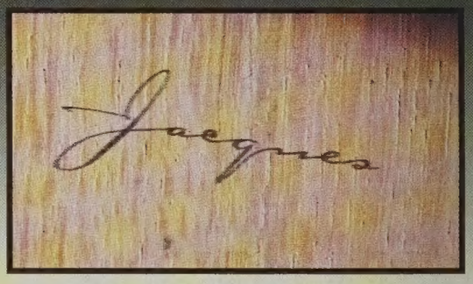

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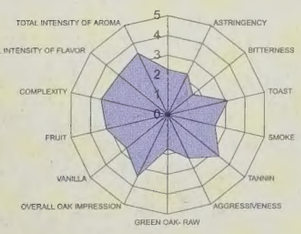
Sensory Profiles

Winery A Custom Profile 1



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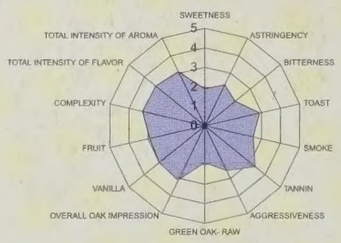

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